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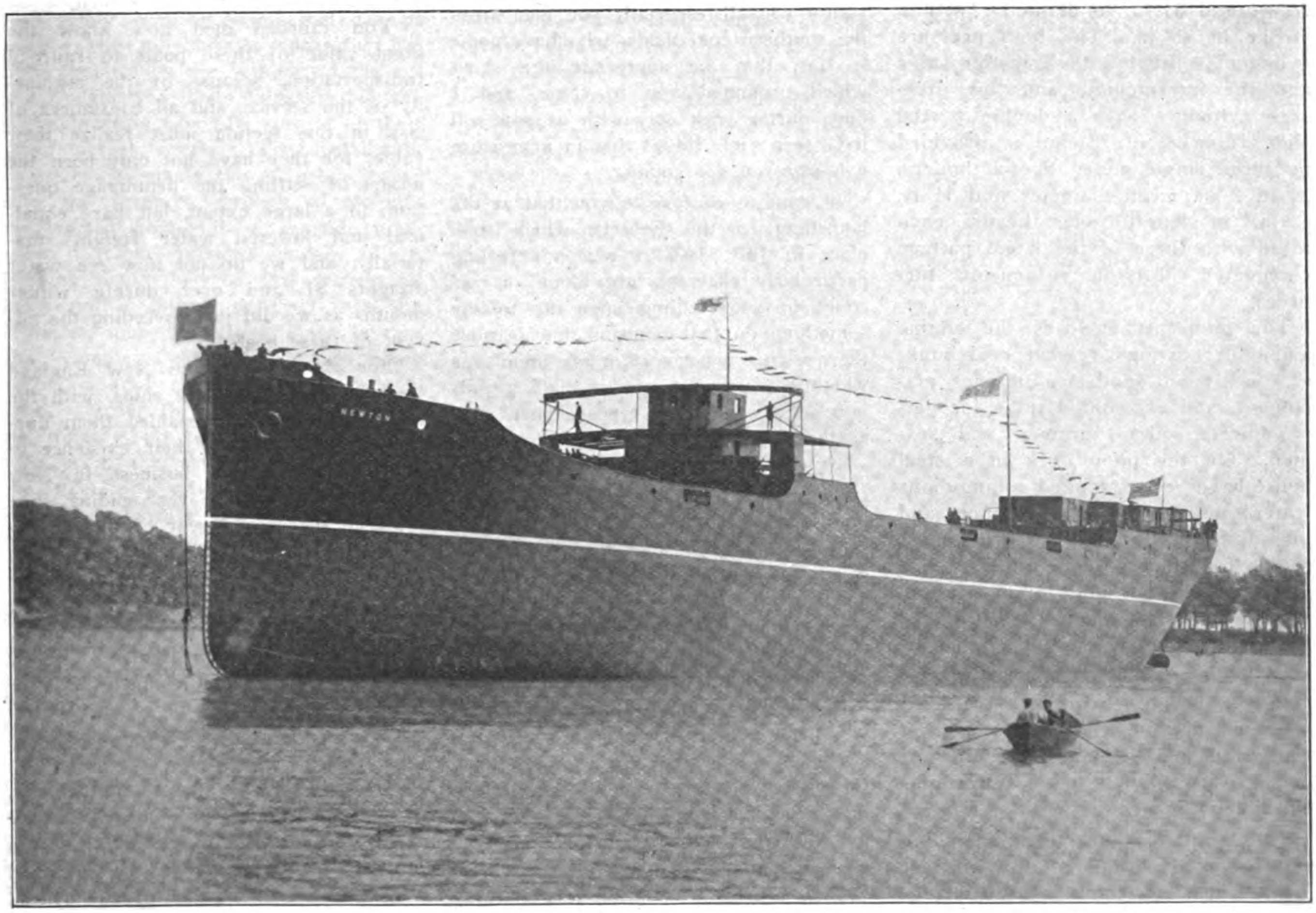
STEEL STEAM COLLIER NEWTON

THE steamship Newton, which was launched from the yard of the Fore River Ship Building Co., Quincy, Mass., on Sept. 25, will form a notable addition to the fleet of the New England Coal & Coke Co., of Boston. The vessel is of the same general type as the Everett, Malden and Melrose, constructed for the above company about four years ago by the Fore River Ship Building Co., and is of the following dimensions:

Length over all....................406 ft. 0 in.
Breadth .... 54 ft. 6 in.
Depth .... 31 ft. 0 in.

This vessel, which has been especially designed for the rapid and economical loading and handling of the bulk coal freight carried between the south and Boston, has a dead weight carrying capacity of 7,200 tons of cargo coal, together with bunker coal, fresh water and stores, all on a mean draught of 23 ft. She is of the single deck type with long poop, bridge and forecastle, constructed on what is known as the topside tank



COLLIER NEWTON, BUILDING AT THE FORE RIVER YARD FOR THE NEW ENGLAND COAL & COKE CO., BOSTON

self-trimming system with scantlings in accordance with the rules of the American Bureau of Shipping and the British Corporation for the highest class awarded by these societies.

The double bottom is divided longitudinally fore and aft by a watertight center keelson with the compartments on each side of same fitted with independent pumping systems. This arrangement permits the ship to be readily heeled over to any desired angle, greatly facilitating the trimming of bulk cargo such as coal, and is in a condition not obtainable in any other colliers on the American boast except the Everett, Malden and Melrose.

The vessel will be rigged with three pole masts and the machinery will be located aft. The cargo hold has been subdivided by transverse watertight bulkheads into five large compartments, each being operated through two hatches, 30 ft. wide by 15 ft. long, the large hatches facilitating the rapid handling of cargo. The hatch covers are of steel and of special construction to insure absolute watertightness and quick handling of the covers in opening and closing.

The machinery installation consists of a set of triple-expansion, surface condensing engines having cylinders 25, 41 and 68 in. in diameter, with a stroke of 48 in. The high pressure cylinder is fitted with a piston valve and the intermediate and low pressure cylinders with a double ported slide valve each. Steam is provided by three single ended Scotch boilers, 14 ft. 2 in. mean diameter and 11 ft. 6 in. in length over heads, each fitted with three of the latest pattern corrugated Morison suspension furnaces.

The poop aft encloses the engine and boiler casings, reserve coal bunker, ice room and ice-making machinery, and accommodations for petty officers, oilers, firemen and seamen. On the poop deck in a steel house have been arranged commodious staterooms for the chief engineer and his assistants, together with mess rooms for officers and engineers, also galley, bathrooms and toilet arrangements. An office has been provided for the chief engineer adjacent to his stateroom.

In the bridge enclosure have been arranged a ship's saloon with guest room and spare room, staterooms for officers, also pantry with storerooms and linen locker.

The captain's quarters, including stateroom, office and bathroom, are located in a steel house on the bridge deck and on top of this the pilot house and chart room have been arranged. The forward part of the pilot house top has been extended to the side of the ship to form a flying bridge, where an electric searchlight, standard compass and steering station have been provided.

The vessel will be lighted throughout by electricity supplied by a marine generating set located in the engine room, while special attention has been paid to the berthing and messing of the officers and crew, in that the quarters will be well furnished, lighted and ventilated.

The Newton was christened by Miss Dorothy Whitley. After the launching a luncheon was served to 500 persons in the boiler shop, and speeches were made by Admiral F. T. Bowles, president of the company, Mayor Charles E. Hatfield, of Newton, President John L. Richards, of the New England Coal & Coke Co., E. E. White, of West Virginia, Congressman John W. Weeks, of Newton, Mass., and William T. Shea, of Quincy, Mass.

At the luncheon, James L. Richards, president of the New England Coal & Coke Co., said:

"It means much in these days, when one's time is so fully occupied, for business men to take the time necessary to attend a launching, and I want to assure you all, especially you men from the southern coal fields, who have come so far, that we appreciate the spirit which prompted you to come, and I hope during your stay with us you will have seen some things that in a measure will pay you for coming.

"I want to confess to you that at the launching of the Everett, which took place in July, 1907, I was not feeling particularly cheerful, not alone on account of your calling upon me to say something on that occasion, but because the question uppermost in my mind was whether the investment of half a million dollars in a new type of boat, such as the Everett, could be made to pay.

"While my immediate business associates and I were sanguine of the ultimate success, some of us, at least, from time to time questioned whether we were right or some of those who had been in the coal business many years longer than we, and who thought we were making a great mistake in building these large boats, which they said would prove to be 'white elephants' on our hands.

"I am pleased to say to you today that our most sanguine expectations have been realized. That others as well as ourselves have found that the type of boat for carrying coal like the Everett, of which the Newton is practically a duplicate, is a success, is demonstrated by the fact that since the Everett was launched, six other ships of like design have been built, three of which have been constructed by others than ourselves.

"In order to utilize a ship of this character and make it pay, one must have satisfactory terminals for the loading and discharging of coal. We have a very large amount of money invested in our terminal at Everett, where we have large pockets and ground storage, traveling bridge, more than 20 miles of railroad track connecting with the steam railroads and 27 ft. of water at low tide.

"At the launching of the Everett, four years ago, in referring to our Everett terminal, I said we expected to be able to unload one of these ships, carrying over 7,000 tons, in not more than 10 hours. At our Everett terminal we now discharge two of these boats at one time, and our record for unloading one of them is 7 hours and 40 minutes, made March 30 of this year.

"I also said at the launching of the Everett, 'We expect to load these ships in from five to six hours.' The record for loading is five hours, made at Curtis bay on Sept. 21, 1909.

"This type of ship would be unsuccessful unless it could be both loaded and unloaded quickly, for the expense, involving interest and depreciation, is more than $400 per day per boat.

"You railroad men now know the great value of these boats to railroad transportation, because of the regularity of the service, and all consumers of coal in this section must realize their value, for they have not only been the means of settling the demurrage question, to a large extent, but have equalized and lowered water freights materially, and we do not now see water freights $1 and over during winter months as we did just preceding the advent of these boats.

"For the owners, the New England Coal & Coke Co., these ships, with the terminals mentioned, enabled them during the first year of their existence to do the largest coal business in New England, and for the year ending June 30, 1911, the second year of their existence, the New England Coal & Coke Co. sold 1,972,000 tons in addition to the sales made by the Federal Coal & Coke Co., the stock of which company is owned by the New England Coal & Coke Co., and which company is now selling at the rate of about 500,000 tons per year."

The bureau of steam engineering, navy department, will shortly invite proposals for the construction of a submarine boat tender to be equipped with heavy oil engines of the Diesel type.

Princess Alice

THE steamship Princess Alice, the latest addition to the fleet of the Canadian Pacific Railway Co., has just successfully completed a series of exhaustive trials at sea off the mouth of the river Tyne. A high speed was maintained and the machinery and boilers worked to the entire satisfaction of the owners, who were represented by Capt. Mowatt, their marine superintendent. The Princess Alice has been built by Messrs. Swan, Hunter & Wigham Richardson, Ltd., for the British Columbian service of the Canadian Pacific railroad. The length of the vessel is about 300 ft. and the breadth 46 ft. The plans of the ship and her construction have been carefully supervised by the steamship representatives in England, of the Canadian Pacific Railway Co. The Princess Alice has been built to fulfill the requirements of the Canadian government for Pacific coast and channel service, and she carries the highest class of Lloyds registry. An interesting feature of the ship is that she is the first of the C. P. R. fleet that has been specially built to carry oil fuel for raising steam in the boilers, though oil burning apparatus has been fitted into several of their old steamers. The furnaces are so constructed that either coal or liquid fuel can be used. The oil burning apparatus has been supplied by the builders of the engines, namely: The Wallsend Slipway & Engineering Co., Ltd., and is of their latest patent system. The installation is extremely simple, the oil being forced into the furnaces through a specially constructed nozzle in a conical spray, when it at once becomes ignited. When burning liquid fuel on this system, all brickwork is entirely removed from the furnaces, and the system is so perfect that complete combustion takes place within a foot or two of the furnace front. From the moment of lighting up, there is no smoke whatever to be seen from the ship's funnel. Among the numerous advantages of burning liquid fuel may be mentioned that firemen are dispensed with; there is no handling of ashes, and no coal dust or dirt in stokehold—in fact, the boiler room can be made the cleanest part of the ship. Furthermore, all of the discomfort and inconvenience of loading a ship with coal in the ordinary way is entirely obviated.

The main propelling machinery, constructed by the Wallsend Slipway & Engineering Co., consists of a four-cylinder, triple-expansion engine with four cranks balanced on the well-known Yarrow, Schlick & Tweedy system, which successfully eliminates vibration, thereby greatly adding to the comfort of the passengers. The engine builders also constructed the four single-ended boilers, each with three furnaces.

The passenger accommodation in the Princess Alice embodies all that the experience of the owners, and skill of the builders could devise, and the ship will be one of the handsomest in her service.

On the promenade deck, the observation room is placed forward, and the smoke room aft, both of these comfortable saloons having large plate glass windows, so as to give passengers an uninterrupted view of the splendid scenery of the coasts, along which the ship will pass. The observation room is handsomely panelled in mahogany and the smoke room in fumed oak, relieved by hammered copper panels depicting ancient "totem" poles of North American Indians, and also specimens of the trees, fruit and grain of Canada. The furniture and upholstery in both these rooms and throughout the ship have been very carefully studied and will make the ship extremely comfortable.

The corridors between the observation and smoke rooms are of polished mahogany with inlaid panels, and lead to a succession of comfortable deck house staterooms. A notable feature of the corridors is that they are surmounted by a cambered roof with a clerestorey, giving a feeling of great height and spaciousness, together with ample light and ventilation.

From the promenade deck, handsome staircases lead down to the upper deck, which is chiefly occupied by a series of first-class staterooms, including several suites of bridal chambers. On this deck there are also two social halls or music rooms.

On the main deck aft is the dining saloon, a handsome apartment panelled in beautiful Italian walnut. A noticeable feature in this room is the provision of specially large plate glass windows. The saloon is arranged with small tables, those at the sides being ensconced in bays. At the after end of the dining room is the pantry and behind that the galley. Underneath the dining room is the first-class restaurant, where meals may be taken "a la carte".

A Marine Harvester

A marine harvester, the only craft of its kind in the world, is about to sail from San Diego to undertake the gigantic task of cutting millions of tons of kelp that grow off the Southern California coast. The vessel, a gasoline launch, equipped with whirligigs, has been christened the Three C's, and will begin mowing the kelp beds off Cardiff, north of San Diego. The crop of kelp at this point will be converted into fertilizer by a big factory at Cardiff and the product marketed immediately.

The Three C's is owned by the Coronado Chemical Co., of Arizona. It is fitted with a jack staff, turned at right angles to the keel by power from the main engine. Vertical shafts on each end revolve the whirligigs 10 ft. below the water. Each whirligig consists of two 4-ft. blades that revolve at the rate of 120 r. p. m.

It has been demonstrated that mown kelp will float ashore in the neighborhood of Cardiff within half a mile of the place where it was cut. A force of harvesters will work along shore, dragging the kelp from the water as it washes in and spreading it out to dry. As soon as it is dry, the weed will be loaded upon wagons and hauled to a storage house in the same fashion as alfalfa hay is handled in the north.

Numerous mechanical contrivances for cutting kelp have been tried out in the south, but all proved failures until the whirligig device was invented.

One of the most interesting of the experiments was with a 20-ft. scythe, operated on the same principle as an ordinary land mower. The scythe, however, did not prove practical for sea-mowing.

Vessels for Cuban Government

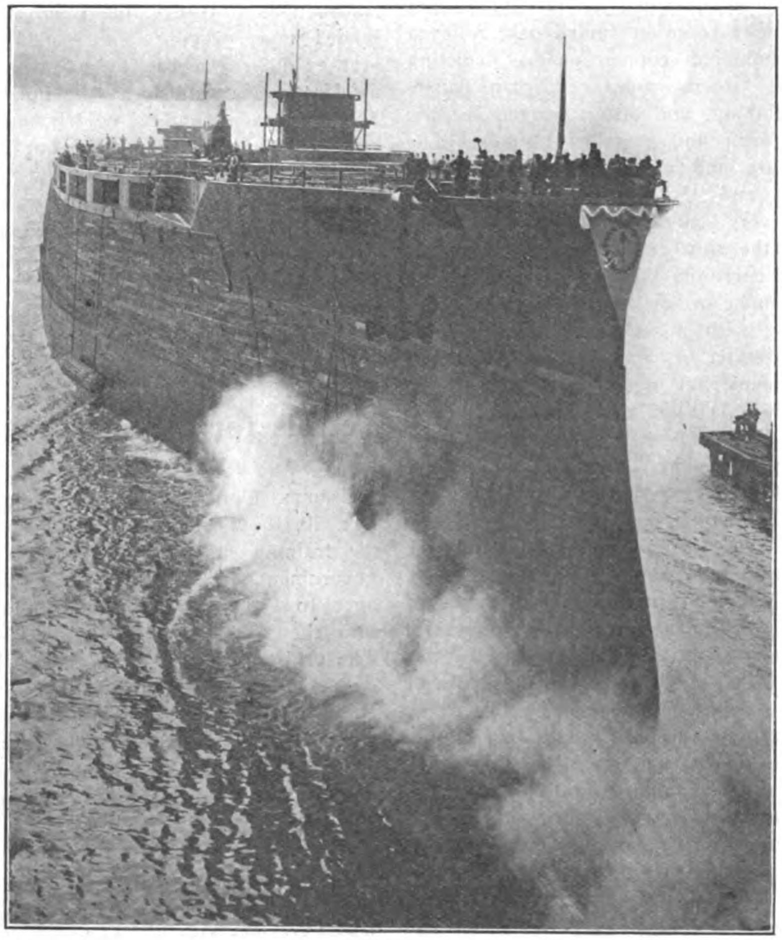
Cramps, Philadelphia, will launch, on Oct. 10, the protected cruiser Cuba and the training ship Patria, for the Cuban government. This event is of importance to Cuba, as it marks the advent into the water of her first war ship. The cruiser is 260 ft. long, 39 ft. beam, with a draught of 13 ft. She will carry two 4-in. guns, four six-pounders, four three-pounders, four one-pounders and several other guns of smaller caliber. The Patria will be 185 ft. long and 34 ft. beam.

An addition to the freight craft of the Colorado river will be the stern wheel steamer Maisie, which was shipped from the yards of Schulze, Robinson & Schulze, at San Francisco, during the first week of September. The vessel was constructed at the yard, then knocked down and shipped to Salt Lake City via the Western Pacific. At that point the materials will be packed on mules and carried to the head waters of the Colorado river, where they will be assembled and the vessel placed on the run between a number of mines and a large smelter. She will tow one and two barges on each trip up the river.

LAUNCH OF BATTLESHIP MORENO

THE New York Ship Building Co., Camden, N. J., launched on Sept. 23 the battleship Moreno, building for the Argentine Republic. The Moreno is a duplicate of the Rivadavia, which was launched a few weeks ago at the yard of the Fore River Ship Building Co., Quincy, Mass. Admiral F. T. Bowles of the Fore River company secured the contracts for these two battleships while abroad in the early spring of 1910, the understanding being that they should be built in different yards. A description of the Rivadavia was published in the August issue and any extended mention of the Moreno is therefore unnecessary.

Briefly the battleships are 585 ft. long, 93 ft. beam, with a normal draught of 27 ft. 6 in. The normal displacement is 26,500 tons but with all weights aboard and a fair supply of fuel, the displacement is expected to be 27,500 tons. The ships will have an armor belt of 12 in. uniform thickness, 200 ft. long and extending 4 ft. 9 in. above and 3 ft. 4 in. below the normal water line. This will be continued at a thickness of 10 in. for a distance of 75 ft. to include the extreme turrets. The battleships are turbine-driven and are designed for a speed of 22 knots. The cruising radius is to be 10,100 knots at 11 knots speed, 7,200 knots at 15 knots speed and 3,600 knots at 22.5 knots. The accompanying photograph shows very clearly the inclosed building sheds of the New York Ship Building Co. in which work may be continuously prosecuted all the year round regardless of the weather.



THE LAUNCH OF THE BATTLESHIP MORENO AT THE YARD OF THE NEW YORK SHIP BUILDING CO., CAMDEN, N. J.

The launching ceremony was performed by Signora Ysabel de Betbeder, wife of Admiral Betbeder, chief of the Argentine naval commission in the United States.

Care in Using Liquid Fuel

For the information of those who use liquid fuel on board ship, the United States navy department has issued an order in the hydrographic bulletin. The instructions and precautions are as follows:

Fuel oil as supplied to vessels of the navy is the residue of crude oil after the removal, by distillation, of sulphur and volatile oils and gases. It is inert, non-explosive, very difficult to ignite in bulk, and not capable of spontaneous combustion. The vapor from this oil is, however, explosive when mixed with the air, and, being heavier than air, tends to accumulate in low levels such as bilges and bottoms of tanks, where it may remain undiscovered until ignited by a naked light or spark. This vapor is always present in a partly filled oil tank, or in a tank which has contained liquid fuel and from which the vapor has not been removed by artificial means, and is given off through the vents from tanks in process of being filled.

A leak in any part of the oil-burning system may, if allowed to endure, result in an accumulation of this explosive vapor, unless the leak be located in the path of air to the furnace.

Ignition of the vapor has been caused by an open light, electric spark, smoking, spark caused by striking metal, heat from the filament of a broken electric lamp, sparks from funnel, or has been communicated from the galley or the fires under boilers.

An oil fire cannot be extinguished by water, but may be extinguished by sand, steam, or chemical fire extinguishers.

An intelligent appreciation of the properties of liquid fuel, as described above, is a better preventive of accident than adherence to any set of rules that may be prescribed.

The following detailed precautions will, however, be rigidly enforced:

1. When oil is being received on board, no naked light, smoking, or electrical apparatus liable to spark will be permitted within 50 ft. of the oil hose, tank, compartment containing the tank, or the vent from the tank.

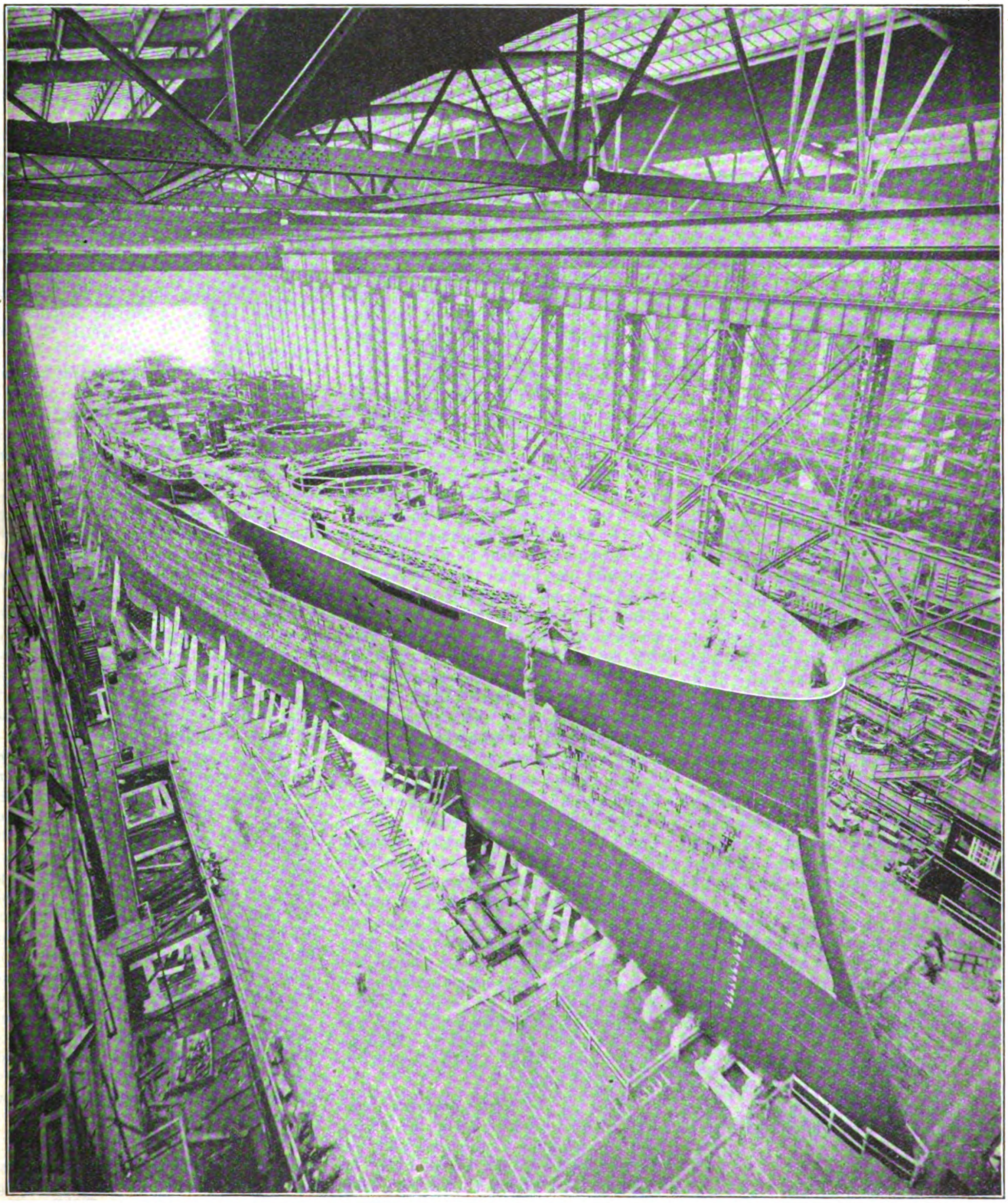
2. While receiving liquid fuel the storage tank must be closely watched for leaks, and care must be taken that

all outlets from the tanks, except the vents, are closed.

3. No naked light, smoking, or electrical apparatus liable to spark shall be permitted at any time in a compartment containing a liquid-fuel tank. Electric lamps used in such compartments shall have wire protectors around the bulb, or shall be of a type that will insure the breaking of the circuit through the lamp in the case of breaking of the lamp.

4. No one shall be allowed to enter a liquid-fuel tank until it has been gas-freed by the use of steam, and any person then entering the tank must have a life-line around his body properly tended in order that he may be hauled out if overcome by gas.

5. Smoking, electrical fuses and switches, unless of the inclosed type,



THE ARGENTINE BATTLESHIP MORENO, JUST PRIOR TO HER LAUNCHING—THIS PICTURE EXHIBITS VERY GRAPHICALLY THE GREAT ENCLOSED BUILDING BERTHS OF THE NEW YORK SHIP BUILDING CO., AT CAMDEN

shall not be permitted in compartments containing liquid-fuel pumps or piping, except that smoking may be permitted on the fireroom floor plates in front of the furnaces.

6. Care must be taken that the wire-gauze protectors in vent pipes from liquid-fuel tanks are at all times intact, and smoking will be forbidden in the immediate vicinity of these vents.

7. Dampers in the uptakes of boilers must be kept full open while burning oil. Otherwise there may result dangerous accumulation of gas in the furnace with a resultant backing out into the fireroom.

8. The valves on glass gages on liquid-fuel storage or settling tanks shall be kept habitually shut. When a reading of the gage is desired, the valves may be opened, but must be at once shut again.

9. In each fireroom fitted for oil-burning there shall be fire-extinguishing apparatus, consisting of: Steam fire hose, permanently coupled and of sufficient length to reach all parts of the fireroom, and either (*a*) a box containing about two bushels of dry sand with a large scoop, or (*b*) chemical fire extinguishers of the tank type.

10. When the liquid-fuel system has not been in use for a period of a week, or after joints in the piping have been remade, the system shall be tested cold, under pressures at least equal to the working pressures, before fires are lighted. During this test there shall be a careful inspection for leaks.

11. Liquid fuel will not habitually be heated above 150 deg. F., and never above its flash point in any part of the system except in the burners.

12. Return connections from the burner-supply line, permitting the recirculating of oil through the heater will not be permitted.

13. Care must be taken to prevent the accumulation of oil or vapor in any place outside the system, particularly in bilges under the furnace. This can best be accomplished by rigid cleanliness.

14. In the event of a considerable accumulation of oil in the furnace, such as may be caused by a sudden extinguishing of the burners, the vapor must be blown out through the smoke pipes by steam hose before fires are again lighted.

15. For lighting the burners, a piece of burning waste on the end of an iron rod, about 4 ft. long, is recommended. This is to protect the fireman from a back flash.

The Santa Cruz Portland Cement Co., of Santa Cruz, Cal., has applied for a franchise from the government to construct a 2,000-ft. concrete pier.

Trials of Collier Neptune

IN REPLY to an inquiry concerning the recent trials of the naval collier Neptune, the navy department, through its acting secretary, informs THE MARINE REVIEW as follows:

"This vessel, which is fitted with Westinghouse turbines and the Melville-Macalpine reduction gear, was given her preliminary contract trials, July 26-29, 1911. On the 48-hour full speed and endurance trial the contract speed of 14 knots was not maintained, due to the use of very inefficient screws. The average horsepower was 5,409 b. h p., corresponding to 5,879 i. h. p. The mean revolutions were 119.5 and the mean speed was 12.926 knots. The coal consumption was 1.79 lbs. per i. h. p. per hour. The reduction gear worked very satisfactorily on the trials with but little noise and no appreciable vibration. New propellers of more efficient design will be fitted and better results may be anticipated in the near future. In the meantime the vessel is to be taken over and used by the navy department, subject to the condition that the original contract requirements be fulfilled by the vessel on trial after the changes indicated above."

It is understood, however, that when the Neptune first went to sea, with fresh fires and the boilers clean, carrying a steam pressure of 200 lbs., she made about 15 knots per hour. The steam pressure is said to have fallen from 200 lbs. to 150 lbs. per gage and the speed of the vessel naturally fell off. Rear Admiral George Wallace Melville wrote to the *Army and Navy Journal* concerning the performance of the reduction gear as follows:

"As regards the operation of the reduction gear, its performance was and is considered perfect. At all rates of speed it ran comparatively noiseless. There is a 30-k.w. illuminating set located in the turbine rooms, and, although it ran as perfectly as turbine dynamos usually do, it drowned the noise of the main turbines and gears. The only disagreeable noise noticed was the whistling of the steam entering the turbines. In fact, the only machinery on board the ship that was perfect was the reduction gear and the Westinghouse bridge control of the turbines in the engine rooms.

"There is an electro-pneumatic control of the turbines from the bridge, and in operating it, experimentally and without notice to the engine room, the turbines were reversed from full speed ahead to full speed astern in from eight to 15 seconds. This bridge control is really only applicable to turbine engines. No marine engineer would apply the system to reciprocating engines, as they are liable to catch on their dead centers, no matter how quickly the links might be thrown back and forth. There is no dead center to a turbine. The advantage of quick control of the turbines from the bridge cannot be questioned in maneuvering or avoiding collisions, known to all seafaring men.

"As regards the economy of the turbines in water consumption, that is a mooted question in this case because of the many elements in question, however. The fact is that the Westinghouse company are building, installing and guaranteeing turbine generating sets of large powers at 12 lbs. of water per h. p.; therefore, there is no question of their making a marine installation at 14 lbs. per b. h. p., which is their guarantee.

"There will be no replacement of the reduction gear, although it is conceded that a greater economy would accrue if a higher ratio between pinion and gear is made. Mr. Westinghouse has made his guarantees to the contractors and the navy department, and it is unnecessary to say that he will make them good, even though it be necessary to built new turbines and install them at his own expense. He always makes good and fills his contracts to the full.

"The propellers of the Neptune gave a mechanical efficiency of but 59 per cent; these are to be removed and replaced by propellers of greater diameter, less pitch and greater projected area, which should give a mechanical efficiency of at least 70 per cent, possibly 72 per cent, which alteration alone I believe would correct all defects or shortcomings in the ship's performance.

"Still, if Mr. Westinghouse, because of the pride he takes in his work, will install new turbines at his own expense, when the department can spare the ship for two weeks after the new turbines are built, it will be all the better for the department and the reputation of Mr. Westinghouse as a turbine man. And in the meantime the department can have the use of this magnificent vessel, and the officers of the navy, no doubt, can do a good deal experimentally with the ship, her turbines and bridge control, and verify all that is claimed by Melville and Macalpine for their reduction gear."

Swayne & Hoyt, of San Francisco, has let the contract for a new coasting steamer to the Craig Ship Building Co., of Long Beach, Cal. The vessel will be of the same type as the Navajo and will be 308 ft. long and 44 ft. beam.

THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE British Association for the Advancement of Science this year again held its meeting at a great manufacturing center, but whereas Sheffield, the venue of last year's meeting, was the principal source of origin of British iron and steel, Portsmouth, this year's meeting place, has mainly to do with the application of these most useful metals to the building of warships. Portsmouth both socially and industrially is a very attractive center and the meeting of the association brought nearly 2,000 members and their lady friends to the great southern naval part. The building of warships is a booming business just now and the enormous dockyards find full work for about 13,000 hands, all building, repairing, refitting, equipping or refurbishing scores of war vessels, and naturally dockyard visits and naval displays formed the principal attractions among the side-shows of the meeting. The visit was favored by perfect weather.

There was a brilliant assembly to listen to the inaugural address of the president, Sir William Ramsay, in the Town Hall on Wednesday evening, Aug. 30. Sir William made several references to America in the course of his address, remarking that in America and Canada, the problem of technical education had been solved by the farsightedness of the people. The British system of scholarships he described as "a form of pauperization practically unknown in any country but our own," and expressed a marked preference for the American system in which the practice is "trusting the teachers to form an honest estimate of the capacity and ability of each student and awarding honors accordingly." The president somewhat startled his hearers by anticipating an exhaustion of the British coal supply in 175 years, and strongly urged greater economy in the use of fuel and incidentally commended the American system. "Do as other nations have done and are doing; take stock annually. The Americans have a permanent commission instituted by Mr. Roosevelt, consisting of three representatives from each state, the sole object of which is to keep abreast with the diminution of the stores of natural energy and to take steps to lessen its rate. This is a non-political undertaking and one worthy of being imitated by the ruler of a great country If the example is followed here the question will become a national one."

Visit to the Dockyard.

Several hundred members and friends accepted the invitation of the dockyard authorities to visit the docks. They were met by Rear Admiral Tare, the admiral superintendent, who offered a few words of welcome prior to the tour of the spacious dockyard. A large number of officers with Chief Petty Office Ball, the admiral's assistant, were told off as guides and gave ample explanations of the work in progress. In addition to a large number of destroyers, torpedo boats, etc., in dock there are three super-Dreadnoughts finished or in course of building and equipment. The only one finished is the St. Vincent, a magnificent vessel of 20,000 tons displacement, which was placed in commission only last year The two others are the Orion (representing, as the admiral said, "quite the latest thing in battleships"), just now receiving her fittings, and The King George, which is to be launched in about a month's time. Both the latter were rather jealously guarded and close inspection was not permitted. The Orion has a displacement of 22,500 tons and The King George about the same, but the latter is to be armed with 13-in. guns as compared with 12-in. on the two other vessels. Over the St. Vincent, the visitors were permitted to roam at their own will from the stokehole to the lookout platform, a few even risking their necks climbing the perilous ladders on the iron masts. The distinction of the St. Vincent is that beyond all its predecessors it is an electrically fitted ship, full of telephones, electric lifts and scores of small electrical engines for all sorts of purposes. The armor on the vessel comprises ten 12-in. guns, 20 4-in., four 3-pounders and six maxim guns. It is possible to concentrate nearly all the big guns in a terrific broadside with a range of 15,000 yards. For the building and equipment of these giants several of the largest steelmaking firms have been pressed into the service and in the yard were several 20-ton armor plates of the highest quality produced by Vickers, Ltd., of Sheffield, for the armor of The King George. A large new dock, deep enough to float the biggest Dreadnought, is in course of construction and will soon be finished. The workshops generally are of large size and well equipped with machinery for handling and turning out heavy gun and ship fittings. The guns themselves, it may be added, come from Woolwich.

Other entertainments for the day included a garden party by Sir John and Lady Brickwood, and a reception in the evening by the mayor and mayoress (Alderman and Mrs. T. Scott Foster) at the South Parade Pier.

Problems of Marine Mechanism.

The second session on Friday of the engineering section (G) was devoted almost wholly to power problems in connection with marine engineering. A long and interesting discussion was initiated by a paper from H. A. Mavor, of Glasgow, on "Electric Drives for Screw Propellers." The paper is reported in full in this issue.

The extent to which the proposed system has been adopted in the United States and particularly by the American navy made a great impression on the meeting. Some speakers expressed regret that the British navy had allowed itself to be forestalled by America in this matter.

Professor Dalby, in opening the discussion, said that the paper marked a very interesting departure. The question naturally arose whether the flexibility gained by the system was in any way secured by the sacrifice of efficiency. He would like to have figures relative to mechanical efficiency in full load, half load and quarter load There must be considerable flywheel action and that would give rise to interesting problems in connection with ship oscillation.

Prof. Pettival said that one of the most important problems was that which had to do with the difficulty of obtaining efficiency with high-speed turbines as compared with low-speed propulsion. The advantage of running one part of the plant alone was beyond doubt. But they had to consider also the greater danger of

breakdown when they had three separate units of power, and the breakdown of propelling machinery might prove extremely serious. The application of the switch-gear had the same disadvantage.

Sir William White thought they were much indebted to Mr. Mavor for giving them the result of his experience and they must congratulate him on the progress attained, and the successful substitution of facts for mere schemes and intentions. He gathered that the American authorities, having been impressed with the success of the experiments on a small scale, were prepared to go further. Now that the states had adopted the system there would soon be a comparison available which would enable a judgment to be formed of the vessel now on its trials and such a report would be worth a great deal to British designers. Fortunately, in the United States they were in the habit of publishing the results of their experience. Personally, he had repeatedly expressed the view that the greatly lessened efficiency experienced from propellers having a high rate of velocity was not going to be permanent. An advance had already been made, and there was a possibility of further advance. The experiments made by Mr. Taylor of the United States navy satisfied him that with modifications in the propeller it was possible to secure a much higher rate of revolution while maintaining considerable efficiency. Sir Henry Oram, the engineer-in-chief of the royal navy, had stated that the vessels of the Invincible class were quite satisfactory, as shown by mechanical experiments, when compared with other vessels of much slower revolution. That demonstrated the possibility of increasing efficiency with a high rate of revolution. The progress made must greatly influence the development of propelling machinery. He thought Mr. Mavor had been perfectly fair in his statements as to the advantages obtained from electrical driving. But the system, though it would go on, would have to justify itself in regard both to economy and carrying power. While the British government has missed the opportunity of making the first trials, they might depend upon it that those in charge of the designing department of the royal navy would not fail to avail themselves of any means of progress that might be offered, wherever such means might emanate from.

Mr. Howe disagreed with those who found sources of danger in the three links of transmitted power. He believed that the squirrel cage motor, especially with the alternating generator, could be made extremely reliable. He saw no more likelihood of breakdown than in the present system.

Dr. Morrow said that the question was exactly what type of vessel the electric drive was most suitable for. If they took the case of the low-speed cargo-carrying vessel, the question was one between the reciprocating engine and the gear steam turbine.

Sir William White pointed out that so far from the United States navy discarding the steam turbine, as speakers had suggested, that was not the case. The authorities had merely decided to install one vessel.

The chairman invited remarks from electrical engineers as to what would happen if the motor were drowned out and whether in that case short circuiting would be dangerous.

B. P. Haigh said there had been cases of vessels flooded with water in which the motor continued in operation because the voltage was not high.

Mr. Mavor, replying, said that the voltage ranged from 600 to 2,000 and if there was any reason for the voltage being kept down that could be done. As to mechanical efficiency they might rely on 90 per cent although it was quite possible to raise it to 96 per cent. To avoid exaggeration he had put the figure at 90 per cent. In carrying vessels, the coal consumption would be at the rate of 1½ lbs. to 1¾ lbs. per horsepower. As to the possibility of special strain on the bearings, in the motor he tried, namely that on the special boat, the "Electric Arc," they had about 10 cwt. in the rotating part, and there was no indication of any disturbance in the motor. Nothing could possibly have run more sweetly. No danger whatever would arise through having three sets of machinery. But it was misleading to speak of three sets of machinery, because two were perfectly connected. As to the alleged complications, that was mere nonsense, and the action was really simpler than with an ordinary engine, although not so simple as the direct connection of the turbine to the propeller. There was possibility of very great improvement in propellers through the introduction of high-speed revolutions. With a slow-speed ship 70 to 150 revolutions a minute was about the highest attainable. There was no danger of electrical breakdown. The efficiency of squirrel-cage motors was comparatively low, but it would bear favorable comparison with that of steam engines. With regard to the engines for the Canadian lakes, it was proposed to drive at 4 to 5 knots in the canal, but at 8 or 9 on the open lake. There was no danger from short-circuiting. He expected an explosion from short-circuiting would mean the destruction of plant. But if they had only one generator they could not damage that by short-circuiting. If the power coupled behind was of corresponding size there would be no danger. In the experiment he tried—much against the will of the admiralty inspector—the short-circuiting made no difference for the vessel went on as if nothing had happened. He had actually worked the motor under water and it still continued to work.

The chairman (Prof. Biles, LL. D.) pointed out that the question of economy was quite as keenly watched by owners of boats crossing narrow channels as by those owning seagoing vessels.

Electric Steering.

B. P. Haigh then read a paper on "Electrical Steering," which is reprinted in this issue.

Sir William White said that personally he was in favor of electrical steering gear, the advantage being very great. In an important experiment he tried he had difficulty solely through the nervousness of the operator, who kept on moving the gear without giving the limiting gear time to do its work. It was very necessary to put on in the early stages of the experiment a helm indicator operating independently of the gear so that the steerer could know exactly where the helm stood. It was impossible to legislate for a man of nervous temperament. They all knew there was a necessity for better mechanical power in the steering gear. But some quartermesters never would let the helm alone. He kept a rcord in one case and was astonished to find the number of times the helm was moved in five minutes. Those frequent movements had no practical value in keeping a steady course.

C. Hawksley inquired whether it was proposed to have a hand-steering gear in case the electrical apparatus got out of order. He knew a case where the gear went wrong and the hand gear was also out of order. If the mishap had happened half an hour earlier the vessel would probably have gone on the rocks.

Mr. Haigh, replying, said that with regard to fiber they had very little trouble with it, except that it absorbed moisture badly at first. But the trouble was got over by boiling

the fiber in different kinds of oil, which filled up the pores. They preferred to work at a pressure of 100 lbs. to the square inch.

On Tuesday a paper was read by J. H. Rosenthal on "Crude Oil Marine Engines," to which attention will be paid in a later issue.

Electric Drives for Screw Propellers*

By H. A. Mavor.

THE problems of marine engineering have until recent years been solved exclusively by the application of various forms of the reciprocating steam engine and the power, speed, form and general arrangement of power-driven vessels have been developed in connection with this means of propulsion.

The advent of other appliances has opened up new lines of development, and in certain departments there is evidence of need for intermediate devices between the power-producing and the power-absorbing elements. The necessity for these devices arises when the properties of the propeller in respect of rate of revolution are incompatible with those of the power generator.

This incompatibility is most conspicuous in vessels which have to operate at relatively low speeds. An examination of the conditions which have emerged in the development of marine propulsion soon shows that the incompatibility is not accidental, or due to imperfections in the design, construction or use of the propelling equipment, but that it is associated with the essential properties of the substances and appliances with which we have to deal.

It may be said in general terms that high efficiency is associated with low rate of revolution of the propeller, while in the steam turbine high rates of revolution are essential to the most economical use of the steam. Internal-combustion engines have speeds more nearly approximating those of reciprocating steam engines, but here also there is a tendency to speeds higher than are convenient or economical from the propeller standpoint.

In addition to those fundamental incompatibilities arising from causes out of the reach of direct accommodation, there are other conditions which limit the direct application of engine to propeller.

The draught, beam and form of the vessel limit the area of the propeller. The traffic for which the vessel is designed influences the determination whether one, two or more propellers are to be used, and the speed, size and form of the vessel determine limits to the designer's choice. All these considerations taken together frequently fix the diameter, pitch and thrust of the propeller, and, within very narrow limits, also the rate of revolution.

Now this rate of revolution is not always the most favorable for the power generator, and the designer is in such cases compelled to resort to new expedients if he is to attach the standard of efficiency in power generation which has been set by results attained on land. At the present moment the economy of power production in the best practice on land is considerably in advance of what has been done at sea. The principal reason for the better economy of the land work is the higher rate of revolution of the power generator when untrammelled by propeller conditions.

There are cases where the special limitations in respect of dimensions and weights permissible for the machinery are such as to preclude the use of any intermediate mechanism between the prime mover and the propeller.

In the ship whose voyage is short, whose speed is high, displacement small and propeller efficiency as good as is attainable and the quantity of fuel carried small relative to the weight of the machinery, the possible economy in fuel may be insufficient to warrant any increase in the weight of machinery; or, to put the case otherwise, it is advisable to sacrifice economy in fuel to keep down the weight of the equipment—*e. g.*, a vessel running one-day voyages, and burning 50 tons of coal, could not possibly submit to an increase in weight of machinery in excess of the coal-saving, because such increase would increase the displacement, and therefore the power necessary to drive the vessel.

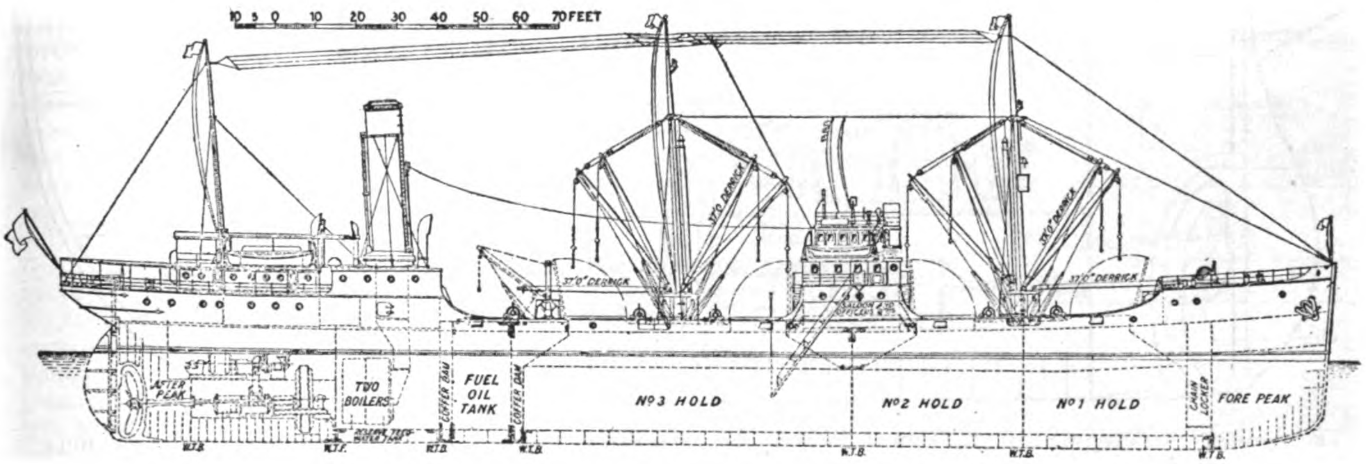


Fig. 1—Outboard Profile of Electric Steamer Frieda

If, on the other hand, the vessel make a 10-day voyage, and the saving in fuel carried amount to 10 tons per day, a considerable increase in weight of machinery might be associated with decreased displacement and a substantial all-around economy.

Various methods of making the required adaptation of generator to propeller are at present under trial. For this, mechanical gearing by toothed wheels or hydraulic transmission may be considered serious competitors with electric transmission, but for large powers it seems reasonable to expect that electric transmission, which is already developed for this very purpose on land, is likely to find an equally useful field, where the conditions are such as to require an intermediate device at sea.

*Paper read before the British Association for the Advancement of Science, Portsmouth.

The cost, weight and efficiency of electric transmission compare favorably in the examples which have been examined with either of the two competing methods.

There are other important qualifications of electric transmission in which it stands altogether unrivalled. The most important of these qualifications are:

It provides a ready means of reversing the direction of rotation of the propeller without changing the direction of rotation of the power generator.

The electric transmission also provides means for changing the speed ratio between generator and propeller, so as to permit of the power of the generator being developed under the most favorable conditions at all speeds of the ship.

Lastly, it provides means for applying the power of one or more engines ities of rapid and certain action are more than are attainable in a reciprocating steam engine connected direct to the propeller, and the electric motor is applicable to power for which there is no possibility of using anything in the nature of reversing gears or clutches.

The property of combining the power of more than one engine for application to one or more propellers is the special feature of the author's inventions as distinguished from the ordinary methods of electrical engineering. Engines of different types, sizes and rates of revolution can have their powers combined without interconnection of their electric circuits, and without risk of mistake or error. An oil engine at 100 r. p. m. may be running the vessel at low speed, and a steam turbine running at 20 times the speed may be jointly applied to the propellers without any suited to a convenient arrangement of the engine room. The size of the individual units can be adjusted to suit the powers required at the different working speeds, or they may be duplicate and interchangeable.

A few examples of application of the system are here presented, together with a description of a small vessel, built to demonstrate and illustrate the principles of operation and to provide experience in the use of the plant. In all cases alternating three-phase currents are used and interlocking devices connect mechanically the main reversing switches with the exciting switches so that no change can take place in the connections while they are passing currents.

Description of the Turbo-Electric Steamship Frieda.

This vessel has been specially designed

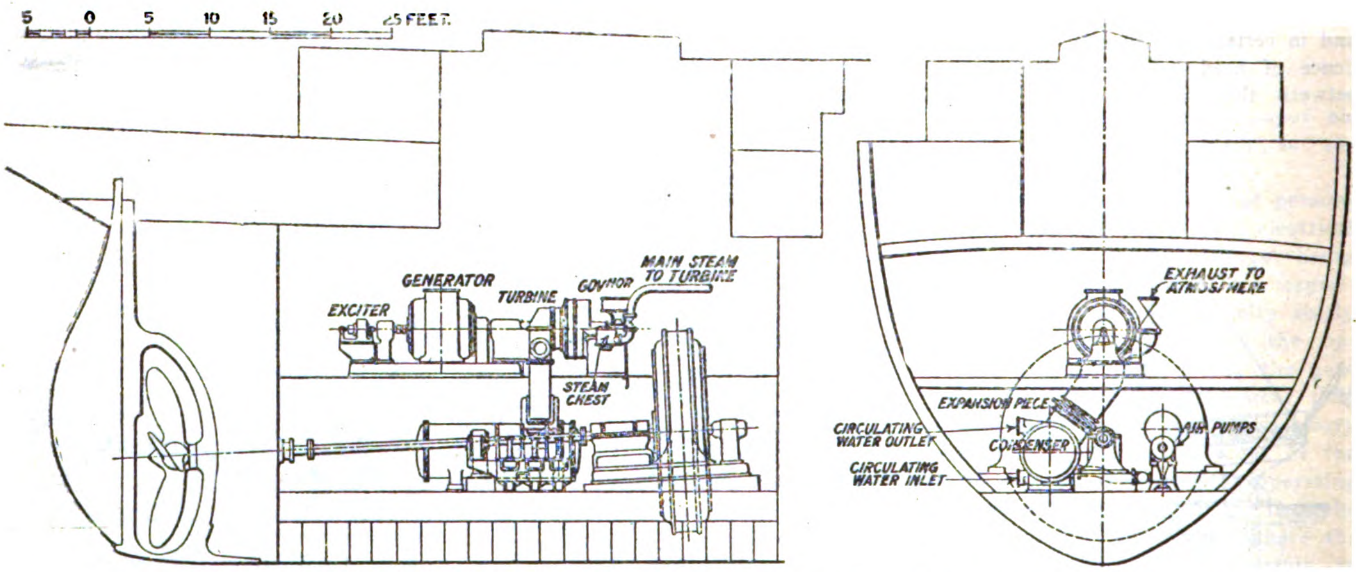


FIG. 2—GENERAL ARRANGEMENT OF PROPOSED 1,500-K. W. ALTERNATING CURRENT TURBO-ELECTRIC MACHINERY FOR BULK FREIGHT STEAMER FRIEDA

to one or more propellers, so that the power generating units may be so disposed as to give the highest efficiency, and when they are not required, they can be stopped. These properties of the electric transmission supply exactly what is required to render steam turbines, and also internal-combustion engines, completely adaptable to the purpose required.

Power generators give their best efficiency when full speed of rotation is maintained, even when running below full power. It is, therefore, advantageous to keep the engine revolutions within the range of governor control while the required speed change is accomplished by electric combinations.

The properties of the electric motor lend themselves well to the requirements of maneuvering. The rate of reversal is under perfect control. The possibil- complication of the electric equipment. Each unit does its own work independently.

The advantage of such an equipment in vessels which are required to operate under varying load conditions is evident. Without subdivision of the power units the whole of the main machinery must be in motion while the ship is in motion.

At speeds reduced below its normal rate of revolution, the turbine is even less economical than the steam engine. Subdivision into high-pressure, low-pressure and intermediate elements has been carried out in certain steam equipments, but this results in a somewhat complicated and inconvenient system of piping, because the steam has to be led from one part of the system to the other across the vessel. In the electric system each unit can be self-contained, and disposed in the manner best for the transport of bulk freights between the Gulf of Mexico and New York City. The vessel is to be 300 ft. long and will carry a dead weight of approximately 5,000 tons at a mean loaded speed of 12 knots at sea.

The propelling machinery is aft, and consists of a turbo-electric outfit for three-phase 50 cycles when running at 3,000 r. p. m. The turbine is supplied with steam at a pressure of 200 lbs. per sq. in. at the stop valve.

This electric generating plant is arranged on foundations on a platform deck in the engine room and the condensing plant in the engine room hold. The condenser is fitted with a vacuum augmenter, and is suitable for dealing with the full load quantity of steam from the turbine. The vacuum obtained will be 28½ in., with cooling water about 85 deg. Fahr. The condensing

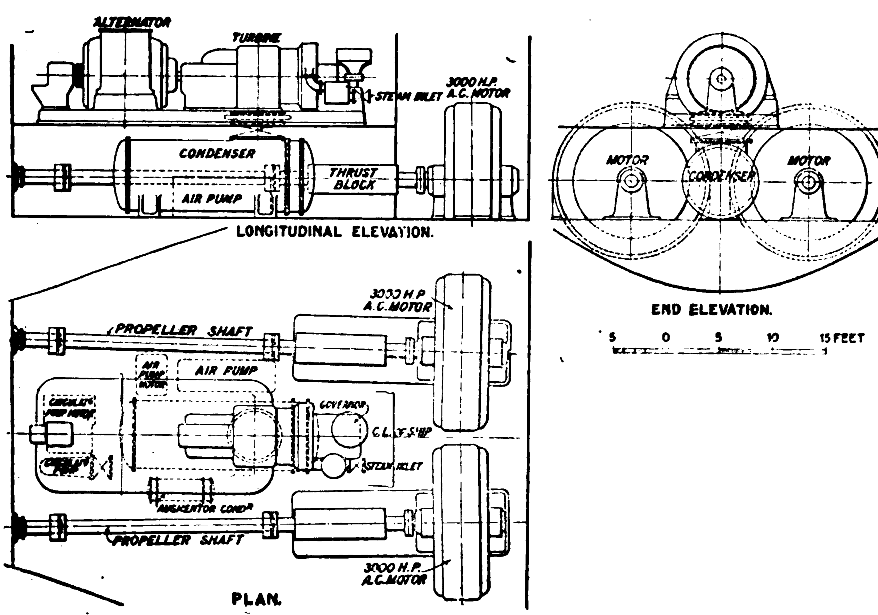


FIG. 3—GENERAL ARRANGEMENT OF 5,000-K. W. ALTERNATING CURRENT TURBO-ELECTRIC MACHINERY, PROPOSED FOR UNITED STATES NAVAL COLLIERS

plant consists of a vacuum condenser, three-throw air pumps and centrifugal pumps with electric motor drives.

The current is led to a three-phase motor, which is keyed direct to the main propeller shaft, and is capable of developing 1,900 b. h. p. at a speed of about 84 r. p. m. The steam is generated in two Scotch boilers, with Howden's forced draft and liquid fuel burners.

This installation costs and weighs less than the normal equipment. The coal-saving is over 10 tons per day.

The design of the ship itself presents many novel features not germane to the subject under review. This design was prepared by John Reid & Co., 17 Battery place, New York.

Oil Electric Tank Barge for Canadian Service.

The illustrations (Figs. 1 and 2) show the application of the system to the propulsion of a 245-ft. Canadian canal type tank barge.

The equipment consists of three separate units of Diesel non-reversible oil engines, each capable of developing 200 shaft h. p., and directly connected to an alternating-current generator. The currents from one or all of the units are respectively led to the separate windings of a three-phase motor keyed to the main propelling shaft and operating a single slow-turning screw.

The great advantage and economy of this system consists in being able to run at full power or at one-third power, using one or three engines at full-load economy at will, thus providing for an economical operation impossible with any other propulsive system. The fact that non-reversible oil engines are used, running under governor control, greatly simplifies the maintenance and operation.

The control is operated by a low-tension interlocking switch, operated by an ordinary engine room telegraph stand located in the pilot house, so that the maneuvering of the vessel is at all times in the hands of the navigating officer. This equipment increases the cost of the ship about 10 per cent above the normal, but the carrying capacity is very largely increased.

Marine Turbo-Electric Installation Proposed for U. S. Navy Colliers.

The installation illustrated in Figs. 3 and 4 shows a marine turbo-electric installation submitted to the U. S. navy department for adoption in one of the four large colliers recently given out to contract.

It consists of a steam turbo-alternator of 5,000 kw. capacity with condensing plant; the current is led to two motors, one being keyed to each propeller shaft. The machinery is right aft in the vessel; the steam is generated by Scotch boilers.

The vessels in which it is proposed to install this machinery are 525 ft. long, and will carry a dead weight of 12,500 tons of coal, at a speed of 14 knots at sea. Here again the cost, weight and economy are better than can be shown with the normal reciprocating-engine equipment.

Log Rafts on the Pacific

The steamship owners of the Pacific coast are uniting to force the government action regarding the large number of log rafts which are being towed down the Oregon and California coasts, and are rapidly becoming a source of great danger to shipping. These monster rafts, containing many millions of feet of piles and poles, are made up in the Columbia river section and are towed down the coast to San Francisco and Los Angeles.

During the past two months six of these great masses of timber have broken away from the tugs which have been towing them and have broken, covering the surface of the ocean for many miles with large logs which are a constant menace to navigation. The logs are almost completely submerged and in many cases cannot be seen from the pilot house

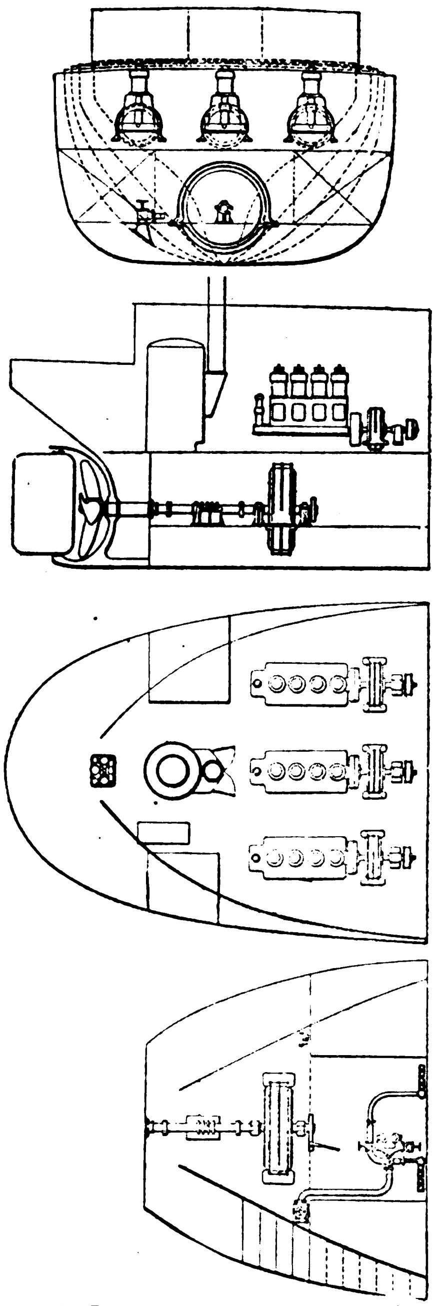


FIG. 4—PROPOSED ARRANGEMENT OF OIL-ELECTRIC PROPULSION FOR LAKE STEAMER, 250 FT. BY 42 FT. 6 IN. BY 19 FT.

of a steamer until the vessel is immediately upon them.

Complaints to the harbor authorities of the various Pacific coast ports have resulted in a counter claim by the lumber companies to the effect that the vessel owners are apprehensive on account of the financial loss to them in consequence of the logs being rafted instead of shipped as cargo. The vessel owners waive all claims as to financial loss on account of charters which they might have obtained, but state that the safety of their vessels is of far greater consequence than the log traffic and assert that they will appeal to the federal government to have the rafting discontinued.

On Sept. 9, the San Francisco bar tug Dauntless and Columbia river tug Hercules lost their line on a 6,000,000-foot raft while passing Peacock Spit, at the mouth of the Columbia, and as a consequence the raft is breaking up and skippers report many dangerous obstructions along the coast. The disaster is the more marked as it occurred in smooth water and controverts the claim of the lumbermen that the breaks occur only in unusually rough weather.

The steamer Frances Leggett lost a large raft during the latter part of August and the logs from it have since been reported from all parts of the coast and there are piles from four others adrift.

The First Sea Aeroplane

THE marine aeroplane is the natural and inevitable development of the land aeroplane, and in course of time it may even prove to be more important. It is intended to be as much at home on the sea as the other is on the solid ground, and with this object in view it is provided with floats designed to enable it to navigate, rise from and descend upon water. Already a successful type of machine has been evolved, and considerably more than a year ago what is known as the Fabre hydro-aeroplane made its first flight at Martigues, France. It attained a speed of 55 kilometers (34.2 miles) per hour in the water. At first it rose about 2 meters (6.56 ft.) from the surface and flew for 500 meters (1,640 ft.). Then it made a flight at 3 meters (9.84 ft.) height and somewhat longer. Seven weeks later a series of flights was made before the airman Louis Paulhan. After rising easily and gracefully from the water, the machine attained a height of at least 20 meters (65.6 ft.) and made a splendid 6-kilometer (3.73 miles) flight. Unfortunately, in coming down it "volplaned" at too great an angle and "landed" with a splash. On land such a descent would have meant total wreck for the machine. As it was, the airman was thrown head first into the water, but received no injuries. The aeroplane suffered only the breakage of one end of a wing and of one of the hydroplane floats.

The Fabre aeroplane, according to the *Scientific American,* to which we are indebted for many of the particulars given in this article as well as for the accompanying illustration, has a depth of about 6 ft. and an area of nearly 280 sq. ft. A 50 h. p. seven-cylinder Gnome engine drives an 8½-ft. two-bladed propeller at 1,100 r. p. m. The total weight in flight is 950 lb., giving a loading of 3.4 lb. per square foot. The design of the aerodynamic part of the machine is accredited to M. Marius Burdin, and the other unique features of the aeroplane have their origin in the inventive genius of M. Henri Fabre.

The body of the machine comprises a vertical chassis somewhat similar to the frame of a bicycle. At the rear we find the principal lifting surface (main plane) with the motor mounted at its after edge; in front, the horizontal and vertical rudders as well as the balancing planes; and in the center the pilot's seat. The entire aeroplane rests upon three hydroplane floats, one in front of the chassis, and the others under the main plane half way between the center and two extremities.

The floats upon which the aeroplane is mounted are hydroplanes of the "Ricochet-Bonnemaison" type, in other words, the bottom of each float forms a hydroplane surface. But, while in the "Ricochet" boats longitudinal stability is obtained by placing one surface in front of the other and joining the two by a vertical surface forming a notch, in the Fabre machine the front plane has been completely separated from the rear plane, and each forms the bottom of a different float. The advantages of this arrangement are that the planes can be quite a distance from each other, which augments the longitudinal stability in water; and as the rear plane is divided into two parallel floats located far apart, the lateral stability upon water is augmented considerably, and the rear floats are not placed in water already agitated by the passage of the first floats. Moreover, each float, since it is made up of a single continuous surface, has a form offering slight resistance to the air. It resembles the shape of the Antoinette monoplane wing. The resistance to the air that the notch would give is thus avoided, and the

THE FIRST MARINE AEROPLANE, THE FABRE MACHINE, STARTING FROM THE WATER—This Hydro-Aeroplane was the First Heavier-than-Air Machine to Make Successful Flights Starting from and Alighting upon Water—The Inset Shows the Front Elevation and Floats of the Machine.

float performs a third function, since it acts as an auxiliary supporting surface in the air. Again, this form of float, with the plane surface below and the cylindrical surface on top, has the advantage of acting like a hydroplane plane even if the float be completely submerged. Thus, though it may be engulfed in a wave, it does not offer great resistance, but, on the contrary, because of its speed, receives an increased upward vertical impulse.

The chief disadvantage of this type of hydroplane is the tremendous pounding it receives when moving rapidly over water that is only slightly rough. The portion of the lifting plane in contact with the water (which is a strip of only a few square inches along its rear edge when the plane is moving rapidly) is instantly increased tenfold at least divergence of the water from a level surface, because of the slight inclination of the plane to the horizontal. The float then receives upward vertical accelerations equal to ten times its weight. To absorb these dangerous shocks the Fabre hydroplane floats have a flexible under-surface. This is made up of thin veneered wood, which acts in the same way as the head of a drum. By this means even the framework of the float is protected from violent shocks from waves. Moreover, very great flexibility is attained between the body of the float and the heavy parts of the apparatus. The elasticity of nearly all the parts of the apparatus, wings, girders of the chassis, steel ropes, etc., comes into play to transmit the upward thrust of the waves to the motor and to the airman. When the Fabre aeroplane is at rest upon water, the floats have an exceedingly slight draught, only about 25 centimeters (9.8 in.) and disappearing altogether when in motion.

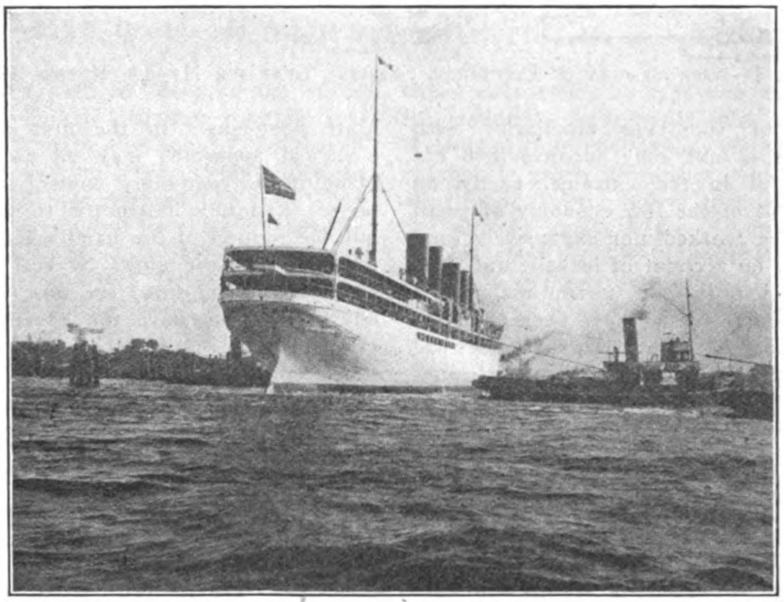
The tapering form of the bottom of the floats permits them to pass over weeds, ropes and other floating bodies, or to skim over shoals without danger, even at high speed. If the Fabre aeroplane should land on a meadow, it would not be injured, for in such a case its hydroplane floats are sufficiently solid to act as regular skids. Moreover, a device is being perfected to permit it to start and land indifferently on land or water.. As for the resistance of the floats to salt water, it is enough to say that during a period of test one of these aeroplanes floated two months on sea water without being withdrawn.

The wings of the Fabre aeroplane, which are capable of being folded, are stretched upon a special steel truss, as shown in the illustration. This form of wing has been patented by M. Fabre. For a marine aeroplane the necessity of folding the wings when the aeroplane is at rest is more important than for a land machine. When the aeroplane arrives at a port where it is to stay several days, it is necessary to fold the cloth of the wings to prevent damage by sudden gusts. The Fabre wings accomplish the solution of this problem, and when the wings are folded, the machine resembles a boat under bare poles. In this respect its advantages over, say, the naval airship constructed by Messrs. Vickers, at Barrow, are obvious.

The wing is composed of four parts. In the first place there is a trussed longitudinal girder at the front edge of the wing, in the position which the bones occupy in the wing of a bird. This is the only longitudinal girder of the wing, and is of substantial construction, as the uprights from the floats attach to it, and it is depended upon for giving rigidity to the whole structure. Then there are the ribs, which correspond to the quill feathers of a bird's wing, consisting of thin strips of wood superposed and glued together. They fit into sockets on the bottom of the single longitudinal of the wing. Thirdly, the covering of the wing consists of a cloth known as "simili-silk," such as is used for the light sails of racing yachts. Sewed by hand, provided with eyelets, and reinforcements such as are fitted to sails, the cloth is not tacked on, but is laced in place. After the ribs are put in place, the cloth is slipped on them and laced to the main longitudinal girder. And, finally, suitable braces hold the main beams of the wings from turning in their sockets when the wings are supporting the machine in flight. Steel cables fastened to the lower ends of these braces serve to regulate the angle of incidence of the wings, or to warp them. The wings are also trussed with similar braces and are mounted upon the floats by means of uprights of the same kind. It remains to be seen how far this marine aeroplane will justify the hopes of its inventor and builder.

The Re-Modeled Deutschland

THE HAMBURG-American Line is one of the shipping companies which does not see any profit in large express steamers. During the Russian-Japanese war they sold all their fast steamers to the Russian government with the exception of the famous Deutschland. At the end of last year, however, the directors decided to change even this vessel into a pleasure steamer of low speed. The alterations have now been completed at the Vulcan yard at Stettin. Her speed has been cut from 24 to 16½ knots; all her second and third-class accomodation has disappeared, and now the entire vessel is devoted to carrying 500 first-class passengers with



THE VICTORIA LOUISE, FORMERLY THE HAMBURG-AMERICAN LINER DEUTSCHLAND

a new promenade deck extending from one end of the ship to the other. Outwardly she has not changed, but her identity to the layman is completely lost under her new title of Victoria Luise. As the Victoria Luise she started on her first cruise on Sept. 23.

Electrical Steering

By B. Parker Haigh, University of Glasgow.

To many who are familiar with the development and the present reliability of steam steering engines, it must appear doubtful whether electrical power can offer any considerable advantage for this purpose. The steering gear being one of several important auxiliaries carried by the ship, the question involves the power supply of all of these. It is generally admitted that the present system of supplying auxiliaries with steam is not only inconvenient but wasteful in the extreme, partly on account of the low economy of small engines worked non-expansively, and partly on account of leakage and condensation in the steam mains. A number of vessels have been equipped with partial installations of electrical power, in some cases for the cranes and boat hoists, in other cases for fans, and as the difficulties connected with these have now been largely overcome a considerably extended use may be expected.

It is beyond the scope of this paper to deal with the use of electrical power for auxiliaries in general, but it is desired to emphasize the disadvantages of a mixed power system involving the upkeep charges on both steam mains and electrical installation. Vessels fitted with internal-combustion engines offer a special field for electrical steering; for on such vessels the steam supply, if available at all, would not generally be maintained at sea.

Electrical power may be applied in steering in connection with two separate problems. In the first place, electrical apparatus may be used in place of the customary control shafting or hydraulic telemotor to transmit the motion of the hand wheel aft to the steering engine. Several such electrical "telemotors" are now available, and these have the advantages of being very easily worked even in the longest ships, and of convenience in installation. The second problem is that of supplying and controlling electrical power for moving the rudder itself, and it is here that electrical steering offers the greater advantage over gears now in general use requiring a supply of steam. The main difficulties experienced in electrical steering have been those of limiting the amount of power required to the capacity of the ship's dynamos, and in controlling the heavy power in a reliable manner. The electric motor must not only be arranged to move the rudder promptly and accurately within the small angles of 5 degrees or less that are required for keeping a course, but must also be capable, without any adjustment of the control gear, of rapidly putting the helm hard over, 35 degrees to either side, against heavy water resistance. As this is the crux of the whole question, it may be well to state working conditions in some detail.

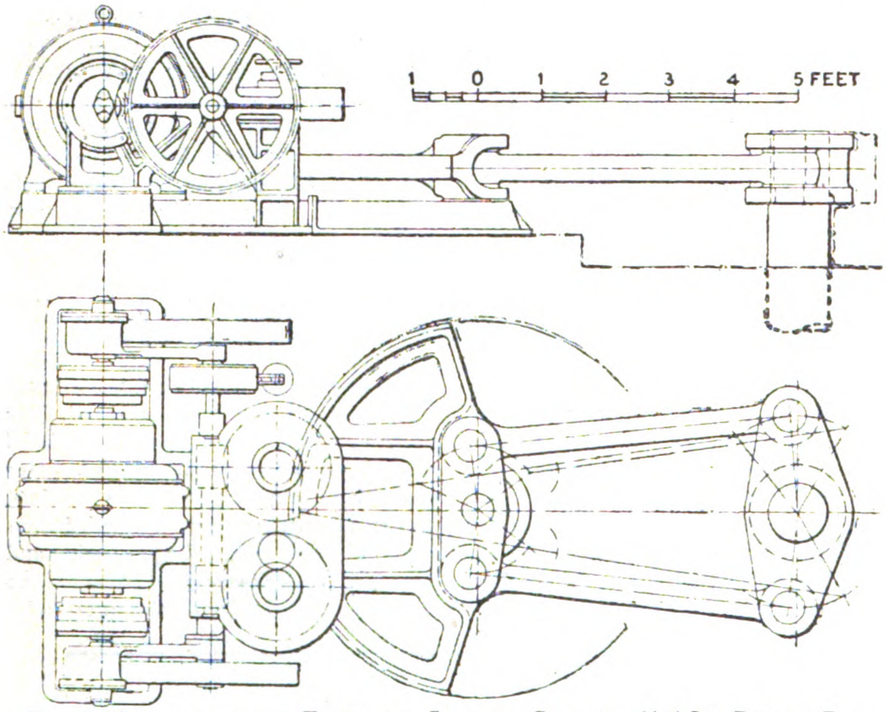


Fig. 1—Arrangement of Electrical Steering Gear for 11½-In. Rudder Post

The action of the rudder in steering is similar to that of the blades of an "Impulse" turbine. Water flowing under the counter of the vessel strikes the rudder surface and is deflected so that its subsequent motion is more or less parallel to the direction of helm. In changing its direction of motion the water exerts a certain force on the rudder, tending to swing the vessel about an axis somewhere well forward in its length, and also acting as a drag, reducing the speed of the vessel. The steering moment reaches a maximum when the angle of helm is about 40 degrees, and as the drag increases quickly it is not customary to arrange the steering gear for angles of over 35 degrees. The time generally taken to bring the rudder from hard-over port to hard-over starboard, or vice versa, varies from 15 seconds or even less in small vessels, to about 40 seconds in the largest, these times being those required while under way ahead.

This power required in the steering engine depends upon the torque produced in the rudder post by the water pressure, which is usually of considerable magnitude, as the center of water pressure is generally some distance abaft the axis of the rudder post, even when a "balanced" rudder is used. Little effort is required to move the rudder within small angles, even when an "unbalanced" rudder is used, partly because the angle of deflection of the water is small and partly because the center of pressure on the rudder surface is near the leading edge. Unless a heavy sea strikes the rudder, the steering motor has, therefore, little to do beyond overcoming friction within the gear itself; and as the great majority of steering motions consist in moving the rudder through small angles near the midships position it will be recognized that electrical power promises economy as compared with either steam or hydraulic power. When the angle of helm is increased, the torque in the rudder post increases rather more rapidly than the sine of

*Paper read before the British Association for the Advancement of Science.

the angle, for an increasing body of water is deflected and the center of pressure shifts further from the leading edge of the rudder surface. After the rudder has been held hard-over for a few seconds the torque in the rudder post falls off somewhat, partly because the vessel commences to swing and partly because the vessel's speed is reduced, but it is clear that the steering gear must be designed to meet the heavier initial stresses and it is fortunate that these can be readily estimated.

In order to economize power the gearing between the electric motor and rudder post should be designed for a high efficiency, and consequently it will not be "self-sustaining." Means must therefore be provided to hold the rudder in its hard-over position. A magnetic brake similar to those used on cranes is suitable for this purpose and will also serve to stop the gearing promptly when the required position has been reached. In returning the rudder to the midships position while the vessel is moving ahead, the force of the water assists the motion of the rudder, and this complicates the matter of the control. Further, when the flow of water past the rudder is reversed, by reversing the propellers, the center of pressure shifts toward the after edge of the rudder surface and considerable power is then required to bring the rudder back amidships even when the speed of the ship is low. It is this fact which prevents a rudder being balanced under all conditions, but nevertheless balancing is a great advantage for electrical steering, allowing a smaller motor to be used, minimizing the demand for current and reducing the wear and tear on the control gear.

Experience has led to the design of steam engines of special proportions for steering, and in the same way electrical motors used need not be designed to carry their full load continuously. Motors of smaller dimensions, for "half-hour rating," and fitted with commutating poles, are preferable, and as the heating limit is not here in question the motor may be totally enclosed in large sizes, without any considerable increase in its dimensions.

Besides possessing adequate power, a steering gear must be satisfactory as regards sensitiveness, that is, it must be capable of moving the rudder to an angle that accurately corresponds to the position of the steering wheel. This is especially necessary within the range of small angles that are used for keeping the vessel on its course. In any steering gear there is naturally some "idle travel" of the steering wheel within which the gear will not respond. In long ships this is minimized by using a telemotor in place of control shafting with gearing, in which latter the total effect of spring and back-lash may be objectionable. But apart from such loss of motion there is a further idle travel due to the practical necessities of the control valve or control switchgear, and this loss is kept as low as possible. Requirements as regards sensitiveness vary greatly and high-speed vessels naturally require closer control than slower vessels, for as the size of the rudder cannot be reduced without loss of maneuvering power at low speeds, very small angles of helm are sufficient for ordinary steering. In the highest class work the steering gear should respond to a motion of the hand wheel corresponding to one degree of helm (less than one-eighth turn of the wheel). Little advantage is gained by working closer than this, and many high-speed vessels with fine lines are worked with gears requiring double this allowance. A certain small amount of idle travel is desirable to prevent the gear being used too frequently. Sensitiveness does not only depend on the idle travel of the wheel but also on the "time lag," in other words, the interval between the movement of the wheel and the corresponding movement of the rudder. In this respect it appears that electrical steering may possess considerable advantage over ordinary steam gears, for as it can be arranged that the rudder responds more quickly a closer course may be kept with watchful steering. As regards idle travel there is little to choose between steam or electric gears. In steam gears the idle travel is kept down by reducing the already small steam lap on the control valve, which, in order to obtain a fast-running gear with little time lag, is generally a piston valve of ample size. Such a valve is liable to leakage when slightly worn. In electrical gears, on the other hand, sensitiveness does not reduce the economy but complicates the control arrangements.

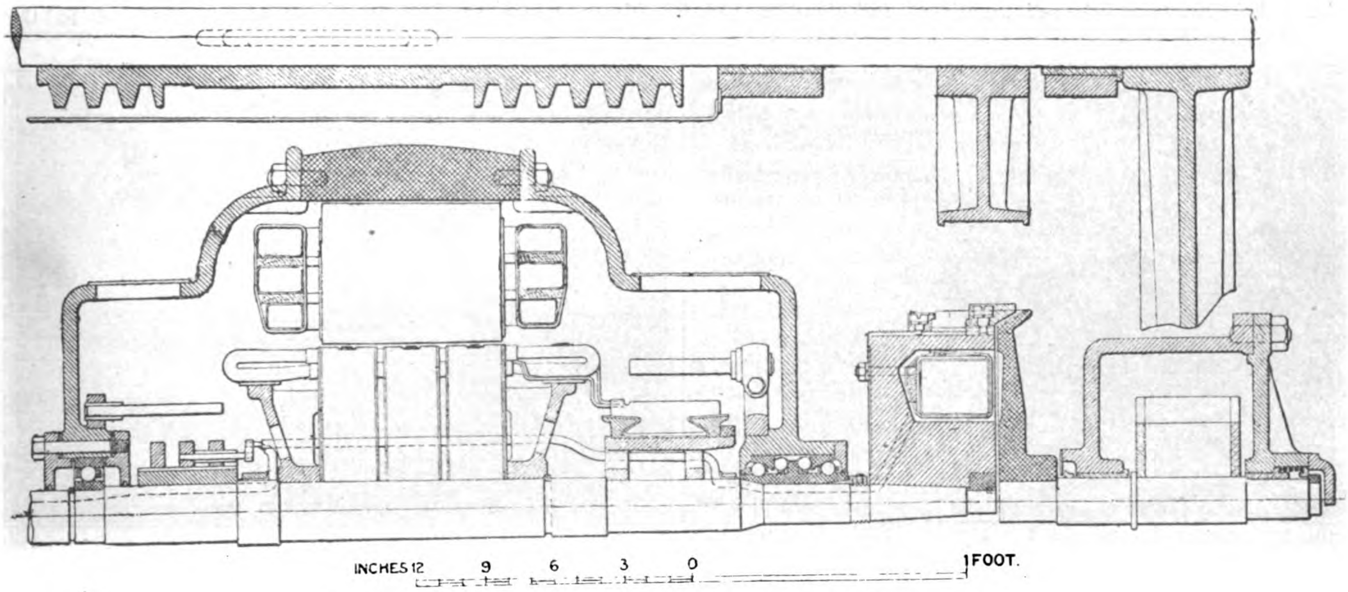


FIG. 2—MOTOR, CLUTCH AND GEARING FOR $11\frac{1}{2}$-IN. RUDDER POST

Electrical Steering.

In the following table a number of different types of electrical steering gear are classified according to the method of control:—

A. Steering gears in which the mo-

tor is started and stopped for every motion of the rudder.

(1) The motor being supplied with current at variable voltage from a special generator.

(2) The motor being controlled by reversing switch and resistance.

B. Steering gears in which the motor is kept running continuously; mechanical control being introduced in one of the following forms:

(1) Friction clutches with gearing.

(2) Hydraulic transmission with rotary or reciprocating pumps.

(3) Magnetic friction clutches on motor shaft.

The second line of development, including the gears grouped together under the heading B, appears to offer more promising results than method A, to which one great objection is the wear and tear unavoidable where so much switchgear for heavy currents is used. A further advantage of the different types classed together under B is that the shock of the sea on the rudder is greatly reduced before it reaches the ship's electrical installation. The armature of the motor acts as a flywheel, or extra flywheel weight may be added, and by using a compound motor a large part of the energy kinetically stored in the revolving masses is given up to the steering gear before any excessive current is demanded from the ship's mains. The steering gear can therefore be supplied from the ship's lighting generator without any noticeable flicker in the lamps coupled to the same mains. It is difficult to overestimate the importance of this feature, both as regards simplicity, and consequently reliability, and as regards economy of power.

To indicate the amount of power required under these conditions we may take the case of the proposed gear described later, and shown in Figs. 1 and 2. This is designed for an 11½-in. rudder post, suitable for a vessel of, say, 450 ft. in length, of 16 knots speed. In this case a motor of 30 b. h. p. is provided, capable of developing a torque of 175 ft. tons in the rudder post, and of moving the rudder through 70 degrees in 20 seconds. These figures are based on special features in the design of the gear and on an efficiency of 64 per cent in the gearing, which, though high in comparison with that of gears having right and left-hand screws, is not higher than that obtainable with double-worm drive. The 30-h. p. motor would be a continuous-current motor with compound winding, and would run at a speed of 500 revolutions per minute under full load, and at varying speeds up to 1,000 revolutions per minute on lighter loads. The current required at full load would be 270 amperes at 100 volts. In some respects, and especially as regards reliability, a three-phase motor is preferable to the continuous-current motor, but its constant speed characteristic causes a heavier maximum demand for power. The choice of the type of motor to be used on any particular vessel naturally depends on many matters outside the steering gear. A vessel of this size, engaged in passenger service, would probably be provided with generating plant for lighting and forced-draft purposes of about 200 kilowatts and if this is divided among four dynamos, each of 500 amperes capacity at 100 volts, it should be possible for any one of these running alone to put the helm hard-over in emergency.

Probably the first electrical steering gear in which the motor was kept running continuously was that designed and built in 1895 by the late A. B. Brown, who may be justly regarded as the pioneer in the scientific development of power-steering gear. Being constructed on the same principle as his well-known steam tiller, the motor of this gear was mounted on a forged steel tiller which carried a pinion engaging with a toothed rack attached to the deck. The control was by means of two metal to metal friction clutches with coil springs, driven at a lower speed than the motor by means of gearing. The clutches were arranged to move the tiller in opposite directions and the chief difficulty experienced was that of obtaining accurate and sensitive control.

In the steering gear designed by the writer in conjunction with Messrs. Brown Bros. & Co., of Rosebank, Edinburgh, the control is by means of magnetic friction clutches, which have several advantages due to the absence of external thrust and the ease of the control. A number of tests have been made on an experimental gear of fair size and it is hoped that some particulars may be of interest. Figs. 1 and 2 show details of a proposed gear suitable for an 11½-in. rudder post, to which reference has already been made in connection with the amount of power provided. Although the motor in this gear runs continuously no gearing is kept in motion as the motor shaft is extended at either end to carry the two magnetic clutches, which are normally out of gear, leaving the rudder stationary. The driven portions of these clutches are carried on bearings and are geared to the countershaft carrying the worm gear in such a way that the rudder is moved to either port or starboard by bringing one or other of the clutches

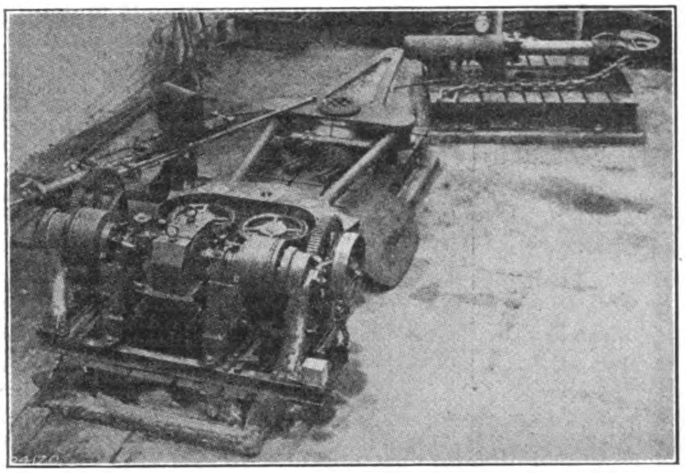


FIG. 3—EXPERIMENTAL STEERING GEAR FOR 7-IN. RUDDER POST WITH HYDRAULIC APPARATUS FOR TESTING

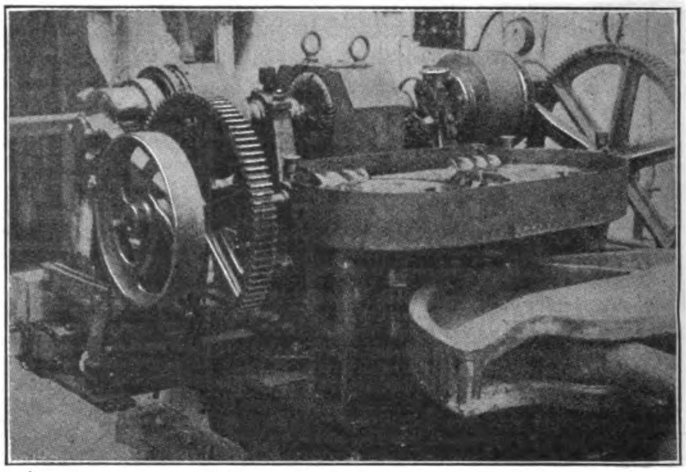


FIG. 4—ELECTRICAL STEERING GEAR, SHOWING DOUBLE-WORM GEAR AND CROSS-HEAD SECTOR

into action. The two parts of the clutch are drawn together by magnetic attraction and a light spring is provided for withdrawing the clutch after the motion required is completed. The friction drive is transmitted by red fiber blocks bearing on the conical edge of the light steel disc that acts as the keeper of the magnet, and no thrust remains to be taken up by collars. Either ball bearings, as shown in Fig. 2, or ring oiling journals may be used, provided the motor has not excessive end play. Provision is made for taking up wear on the fiber blocks by adjusting the inner ring on the clutch body to feed the blocks through holes in the outer ring. In the gear suitable for an 11½-in. rudder post, the clutch coils are fed with a current of one-half ampere, supplied through slip-rings enclosed within the motor. No electrical parts are, therefore, exposed to the action of damp, for as the motor is always running it keeps itself dry. Should it be desired to remove the armature, the clutches are removed at the same time, after sliding the fiber friction blocks back by turning both screwed rings on the clutch body. Impregnated fiber friction blocks have the advantage of engaging silently, whereas wood, although in some cases having a higher coefficient of friction, appears liable to squeak painfully. The mechanical arrangement of the gear, shown in Fig. 1, has certain novel features, notably the use of two pinions engaging with the toothed sector. As these carry equal loads the wear is distributed, and a lighter sector may be used, with teeth of reduced pitch as compared with those necessary if only one pinion were provided. Further, a lower ratio of worm gear is required and a higher efficiency obtained. The loads on the two pinions are kept equal by using right and left-hand worm-gear with an intermediate pinion to keep the direction of rotation right. The two worms are cut on a sleeve sliding freely on the shaft without thrust blocks, and as a certain amount of end play is provided between the bearings, the teeth of the sector can be allowed a considerable amount of wear without disturbing the equal distribution of the load. The quick pitch of the worms and the absence of frictional loss at thrust blocks insures a very high efficiency being obtained.

The power required is further reduced by the use of variable leverage linkwork, in which the rudder crosshead and the dummy crosshead carrying the toothed sector are connected together at different radii so that the connecting rods do not form a parallel motion. The leverage, which in the midships position is 1.5 to 1, increases gradually to 2.2 at the hard-over position of 35 degrees, so that the maximum torque is obtained with less current when the rudder is hard-over; and, further, the gear responds more quickly in the ordinary working range amidships. As this linkwork is not a so-called "geometrical" motion the position of the crosshead pins must be carefully chosen, and when this is properly done no difficulty is found in working over to 38 degrees of helm. In this way a saving of 30 per cent can be made in the motive power, and taking account of the extra efficiency of the double worm-gear, the maximum torque of 175 ft. tons is obtained from a current of 270 amperes at 100 volts instead of 450 amperes, as would be required with gearing of the ordinary type.

These features are incorporated in the experimental steering gear shown along with testing apparatus in Figs. 3 and 4. The hydraulic cylinder for applying the artificial load is connected to the dummy tiller provided for test purposes by chain and is so lined off that the tiller leverage is the same when the rudder is hard-over at 35 degrees as when in the midships plane. It was found that the currents required to produce a pressure of 980 lb. per sq. in. on the 5-in. ram were 60 amperes when hard-over, and 90 amperes when amidships, corresponding to a change of leverage of 1.5 to 1. The time required to cross from hard-over to hard-over was 23 seconds when moving against the above load for 35 degrees out of the total of 70 degrees, the voltage of supply being 90 volts. At this load, which corresponds to a torque of 20.4 ft.-tons in the rudder post, the over-all efficiency is 48 per cent, indicating an efficiency of over 60 per cent in the gear alone without hydraulic cylinder or motor. Under normal conditions the slip of the clutches when engaging was found to be small, estimated by means of a contact maker at between 1 and 2 revolutions, and up to the present, after a considerable period of testing in the works, no wear has had to be taken up on the fiber blocks. When the motor is loaded up to 150 amperes, corresponding to the torque of 50 ft.-tons, the clutches slip, and this current is not exceeded, even when the tiller is butted against a solid obstacle or when the chain is drawn taut from no load to full load.

The arrangements for controlling the clutches, also seen in Fig. 3, consist of one of Brown's improved hydraulic telemotors with a cut-off attachment coupled to the tiller crosshead. The switch-gear, which is operated by mechanism equivalent to cam-gear, is enclosed in the small case (14 in. by 12 in. by 4 in.) mounted above the telemotor. In many vessels the telemotors are now attached to the deck beams overhead and this arrangement is very suitable for electrical steering as it keeps the switch-gear free from water. Being fitted with carbon contacts, and dealing with such small currents, the switches should require but little attention. The cams require to be carefully arranged and free from backlash, to gain sensitive steering; and to stop the gear promptly a quick-acting brake, not necessarily very powerful, is used. The amount of stored energy is minimized by using light steel clutch discs and a motor with shunt regulation, running at its lowest speed when engaging and disengaging.

In installing electrical steering gear it is preferable to avoid the use of fuses or circuit breakers in the supply mains as these are liable to operate just when the use of the helm is most urgently required and any possible damage to the electrical plant is greatly outweighed by risk in navigation. When a gear with friction clutches is used a circuit breaker, adjusted for something over the limiting current of the clutches, may be fitted in the engine room along with an auxiliary motor starter, so that the gear may be immediately restarted without leaving the main switchboard.

In the foregoing notes it may be thought that the advantages of high efficiency are over-rated, but economy is not only valuable in itself and in the reduction in weight which it allows, but also on account of the increased reliability due to reduced wear and tear in the control gear and generating plant.

The new Sacramento Transportation Co.'s stern-wheeler, Colusa, intended for freight and passenger service, was launched from the yards of Schulze, Robinson & Schulze, at San Francisco, on Sept. 1, and has been placed on the San Francisco-Colusa run. The Colusa is 220 ft. in length, 39 ft. molded beam and is 41 ft. wide on deck and 6 ft. 3 in. in depth. The C. H. Evans Co., of San Francisco, supplied the engine and the Eureka Boiler Works, of San Francisco, the boilers. There are two extra long freight booms projecting over the bow for service at the landings, where the levee interferes with the landings. Oil is used for fuel.

FIFTY YEARS' ARCHITECTURAL EXPRESSION OF TACTICAL IDEAS*

By Admiral Sir Cyprian Bridge, G. C. B.

NAVAL architecture is the handmaid of tactics. Warship design is meant to give expression to the tactical ideas and intentions of the epoch. If we examine the succession of types of men-of-war which have appeared during any particular period, we shall be in a position to discern what the tacticians of the time had in view. Regarding tactics, naval architecture, to use a phrase rather common not long ago, is "History from the Monuments." An investigation of the material remains found on the sites of very ancient cities has enabled scholars to give us a conception of early civilization and culture, so investigation of the designs of the various ships constructed in the last half century will furnish us with a clue to the state of tactical knowledge and aspiration during that period. The necessary limits of this paper will allow only our own navy and its principal ships to be dealt with at all fully. Nevertheless, we shall find the field chosen large enough to contain the illustrations required.

It is just over 50 years since the Institution of Naval Architects was founded; and the date of its foundation nearly coincided with the beginning of a time of extraordinary innovation in naval construction for the purpose of war. In the year 1860 what may be called the seventeenth-century type of man-of-war was still represented in the British navy. We had two sailing line-of-battle ships in sea-going commission as flag ships on foreign stations, and several sailing frigates were employed in distant waters. This does not, however, give an exhaustive account of the persistence of the type to which those ships belonged. The steam line of battle ships, steam frigates and steam corvettes—which we were producing in considerable numbers—still had several years of life before them, and resembled in design, appearance, and armament the older classes. The only difference was that, in addition to their sails the later craft had steam propulsion. The gun, as the weapon without a rival, conspicuously dominated tactics.

We have to compare this persistence of a generally uniform type of warship through more than two centuries with the many rapidly succeeding changes that have appeared in the last 50 years. The earlier persistence can in no way be attributed to want of intellectural capacity in the leading naval officers of the day, or to insufficient experience.

When this institution arose, the tactical aspect of naval architecture was in essentials what it used to be in the days of Blake. Signs of impending change were indeed visible; but they were still too few to disturb seriously the general uniformity of warship design. There is a very remarkable fact to be observed in connection with that long maintained uniformity. This fact makes the contrast between it and the multitude of variations in the last 50 years truly startling. Before the end of the eighteenth century tactical ideas had undergone a great change; but the type of ship remained the same and there was no demand that it should be altered to suit the new tactics. The old method of trying to preserve a rigid line in a fleet action, and of bringing one ship against an individual opponent, had been superseded by the method which we associate with the names of Rodney, of Suffren, and especially of Nelson, viz., that of bringing a number of ships against a smaller number. This led to decisive, and, indeed, to overwhelming victories. It adds to the merit of the great tacticians named that they did their work effectually with the tools which they found in existence. When we consider the course of ship-designing during the half century just ended, we shall find a very different state of affairs.

This will appear in an enumeration of the several types produced. In the old type, so long adhered to, the object was to mount a battery of many guns. For the line of battle the tendency was not to alter the type of ship or the system of gun mounting, but to increase—within limits—the number of guns. Thus the 44 and the 50-gun ships fell out of the "line," and the 64-gun ship gave way more and more to the 74. In 1860 the object above mentioned was still kept in view. The Warrior, launched in that year, was intended to have a broadside of 20 guns. Her sister ship, the Black Prince, was to have the same. Indeed, except the turret ship Prince Albert and the Bellerophon, every armored ship launched between 1859 and 1868 had a broadside—allowing for "pivot" guns—of at least 12 guns.

In June, 1860, Capt. Cowper Coles, at the United Service Institution, read a paper entitled "Shot-proof Gun-shields as Adapted to Iron-cased Ships." His proposed ship was really a turret-ship; and it is remarkable that she was to have nine turrets with two guns each, giving, on most bearings, a broadside of 18 guns. This shows that even with him the principle of the numerous battery prevailed.

With the ships that we began to launch in 1871 there came a notable change. From that year down to 1875 we launched 15 ships, all with turrets and all with a considerably reduced number of guns, though some were of much larger caliber.

In this survey it is to be remembered that the British navy only is considered at all fully; but the conditions which prevailed in it resembled closely those to be observed in other navies. We ourselves sometimes copied what was being done abroad; and more often we had imitators in foreign fleets. The French, if not the original proposers, were, at any rate, the first who dared to bring into practical use the armor-clad sea-going man-of-war. The Gloire, launched in 1859, the year before the foundation of the Institution of Naval Architects, may be regarded as the parent of modern armored ships.

Similarly, the Americans first treated the turret ship as a practical addition to a fighting fleet; and were enabled by circumstances to be the first to subject the type to the test of actual fighting.

Ram Attack in Battle.

The Austrians were the first of the moderns to make deliberate use of the ram-attack in battle, and by so doing widely extended the introduction of the ram-bow into the naval architecture of the contemporary world.

*Paper (slightly abbreviated) read at the Jubilee meetings of the Institution of naval architects.

As regards the Gloire, it has to be said that her type did not indicate a new tactical idea or principle. Like the ships of Blake or of Nelson, she was to have a broadside of as many guns of reasonable power as she could carry when her other weights had been provided for. We have already noticed this feature of the Warrior's design. The number of guns soon began to diminish, and the weight of individual guns to be increased. If we omit the Northumberland, of the same type as the Minotaur, launched in 1863, no ship launched between the year just named and 1887—that is to say, during nearly a quarter of a century—had on a broadside a number of guns which ran into double figures.

Was this due to tactical or to other reasons? Did the ships so armed express a principle of tactics, or was their armament suggested by other considerations? It would seem that in fixing a ship's armament, at the time in question, the governing influence was that of the defensive armor. It was assumed that no gun would be effective if its projectiles could not perforate armor as thick as that carried by the ship herself. This included, or, at any rate, allowed for, a belief that the ship to be fired at would have a side wholly plated with such armor. Acceptance of this view rendered inevitable increase in power of individual guns and decrease in the number of guns on the broadside of any one ship. On this there ensued a vehement and still unended practice ground contest between gun and armor.

Contest Between Gun and Armor.

The effects are to be seen in the types of ship produced in different periods. From 1860 to 1870, both years included, we had launched 23 armored ships, of which—not including the converted Royal Sovereign—only three were turret ships.

From the beginning of 1871 to the early part of 1875 we launched eight armored ships, all with turrets. There was then a short time during which we launched broadside ships, one, the Téméraire, being of mixed type. In 1879 we reverted to the turret type, and since that date practically every armored ship which we have built has turrets, or, what may be considered a variety of them, barbettes.

The time referred to did furnish some war experience. It included, besides less important conflicts, the American Secession war and the Austro-Italian war in the Adriatic. In the former of these wars armor-clad vessels were first used in belligerent operations on a considerable scale. The war was peculiar in its nature. It was a contest between two belligerents, one of whom had a large navy and the other had scarcely any navy at all. The naval operations consisted principally of engagements between ships and land fortifications. As regards naval tactics on their most important side, viz., the tactics of fleets fighting against fleets, the war furnished no guidance. Nevertheless, the turret ship made her way into our navy—at first, as we have seen, but slowly. The small number of vessels of the type which during 10 years we added to our fleet supplies evidence of the inconsiderable tactical importance then attached to the type.

The great change introduced in 1871, the virtual abolition of the broadside system of arming ships, occurred at a time when the contest between the gun and armor was in full progress. Naval attention was concentrated on the problems of making a ship invulnerable with armor, and of finding a gun that would neutralize the desired invulnerability. Tactical considerations receded into the background.

In a naval action in the Adriatic an impressive incident occurred. The Austrian sank an enemy's ship by attacking her with the ram. It was rapidly accepted that this indicated the possibility of devising a new, or reviving an ancient, method of tactics. It was hoped, indeed it seemed to have been believed by some, that this would do away with the superiority in defensive efficiency, which was being claimed for protecting armor. The immediate sequel, however, was that the armor became thicker and the guns individually heavier.

As the defensive armor thickened, so it shrank in surface; and a large proportion of an armor-clad ship was either not defended by armor at all or only by armor of moderate resisting power. The names "iron-clad" or "armor-clad" became obsolete, and were deliberately replaced by the less definite term "armored." On this, tactics emerged from the obscurity of the previous few years. The French equipped their ships with a secondary armament of guns capable of dealing with the unarmored or thinly armored parts of an opponent's ship. Before long we followed suit, putting secondary guns into ships not originally intended to carry them, or deliberately designing ships meant to have a secondary armament.

The Weapon Dominates Tactics.

The weapon—as has been said—dominates tactics; and, as the gun is the principal weapon of fleets, naval tactics have been based on what the gun can do. There are other weapons by no means without importance. Their importance, however, is limited, because they are effective only in special circumstances. The ram has been spoken of already. When conditions are favorable to its use it is a highly effective weapon. The difficulty is to bring about the desired conditions, and this difficulty is so great that the conditions must be rare. In 1871 we adopted as a weapon of war the Whitehead locomotive torpedo. Here, again, it is not the effect of the torpedo, but the possibility of planting it where its full effect will be felt, that is likely to be miscalculated.

It is a remarkable fact that the adoption of the locomotive torpedo and the limitation of a ship's gun armament to a small number of the heaviest guns that she could carry occurred almost simultaneously. We did not ignore the importance of the torpedo; but we did not make any tactical provision for dealing with its attacks. We made only arrangements for passive defense, by a more minute internal subdivision of a ship's hull, and afterwards by providing obstructions, such as nets.* We did, however, produce special craft which were to use the new weapon, viz., torpedo boats; and we devised a system of tactics for them. This discloses a very interesting state of affairs. A new weapon had come into existence; tactical methods of employing it, involving the construction of a novel class of vessels, had been devised; and yet tactics were silent as to the means of counteracting its employment. Reliance was placed on passive defense arrangements exclusively. We may attribute this to a new conception of the functions of ships of war of the most important class. For more than 200 years the military value of the warship had been calculated upon what she was capable of doing to an enemy. This was now changed, and her military value was assumed to be based upon what she could endure at the hands of an opponent. She was formally likened to a fortress. A very distinguished authority, writing in 1859, called the ships in our principal fleets "our floating channel and Mediterranean fortresses." We must be-

*There is not room in this paper to deal with the class of craft called "destroyers," which, though they have been converted into merely larger torpedo boats, were originally introduced with the deliberate object of acting against torpedo boats. Their adoption was based on a real tactical principle, which, owing to the plan of using them as torpedo boats, had been lost sight of.

lieve that this was the consequence of devoting great attention and great talents to the work of trying to render an enemy's attack innocuous by providing a ship with the passive defense of impervious armor. The alternative and older methods of frustrating an enemy's attack by bringing against him a superior fire seems at this time to have been given up as hopeless. The probability is that it was regarded—insensibly, perhaps—as hopeless because of the greatly reduced number of shots that could be fired in a given time from the small number of guns that were mounted in a ship. The position, as to defense against the old weapon, the gun, and the new weapon, the torpedo, was that tactics had nothing to say.

The silence of tactics may be ascribed to the then accepted belief that warship design and armament should be based on the intention of destroying an enemy's ship by a single blow. The destructive blow was to be delivered either by the ram at close quarters, or by the torpedo at a moderate distance, or by the heavy gun at longer ranges. No one stopped to inquire into the feasibility of this, or into the relative efficiency of the three weapons. Passive defense, by armor or other material expedient, was deemed both necessary and sufficient.

The General Policy of Defense.

It is surely worth our while to ascertain why this should have been so. If we examine the then predominant notions in our general policy of defense, we shall find that they favored the defensive, and largely the passively defensive. It was accepted, perhaps generally, but certainly by the governing authorities, that the British Isles, and especially the great naval ports in them, were likely to be attacked in force by powerful enemy. The old plan, which, under such leaders as Hawke, St. Vincent, and Nelson, had proved so effective—viz., the preventing of the enemy from getting near enough to deliver his attack—seems to have been forgotten. It was taken for granted that we could not stop our enemy from coming to any point at which he wished to arrive; and that all that we could do was to get behind our fortifications and under their shelter fight him as well as we could. That this would mean abandoning the sea to an opponent, with all the prodigious consequences of such procedure seems not to have been understood.

The waters in which our fleets were wont to anchor were studded with armor-clad forts. It was to these works of defense that the eminent authority above quoted had likened our more important ships. Standing on the defensive was, as it were, in the air; and the prevailing sentiment governed the conception of what a man-of-war ought to be. If she could be made so, she was to be impenetrable by an enemy's projectiles. Somebody heard, or dreamt that he had heard, the navy crying to the naval architect: "For God's sake keep out the shells!" Armor was again thickened, and, being thickened, was again reduced in area; so that shells were effectually kept out of a part, a gradually diminishing part, of the ship, whilst free ingress to the rest of her above water was conceded to them. It was not seen that there was a reasonably effectual method of keeping an enemy's shells from entering any part of the ship, armored or unarmored, viz., by overwhelming him with the fire of your own gun. Admiral Farragut had said: "The best armor is the return fire." Like most apophthegms, this looks at first sight exaggerated. The truth that it contains was not recognized. So, in individual ships, armor was given greater power of resistance, whilst guns decreased in number. The power of a gun was, indeed, increased; but with the object of enabling it to send its projectiles through the more resisting armor on an opponent's hull. The Devastation, Thunderer, and Dreadnought, launched between 1870 and 1875, gave expression to the dominant ideas of the day, when tactical principles attracted so little attention that the word "tactics" was rarely heard, and when it was heard it was applied to the practice evolutions or drill of a fleet.

Progress of Architecture.

If tactics ceased to attract attention, naval architecture by no means stood still. Naval architects were every day showing that they could meet every reasonable demand. If the results of their efforts had no great tactical importance, that was certainly no fault of theirs. A particularly brilliant period in the history of naval architecture coincided with a period of marked dullness in naval tactics. To what are we to ascribe this paradoxical condition? We are justified in ascribing it to the absence of fixed principles from the minds of those whose proper sphere was tactics. Perhaps, without foreseeing the effects of their procedure, they gave up being tacticians in order to deal with details of naval architecture. It is not easy to find any other explanation of the variety of types of ship produced during the period under notice. The variety by itself was sufficient to prove that there was no fixity of tactical principle. It also disclosed symptoms of a belief that architectural design should regulate tactics and not tactics regulate design. Historical monumental proof of this exists in the ships constructed at the time.

The French, who have shown greater aptitude than any other people for treating naval affairs scientifically, were the first to break away from the position above indicated. They understood that a battle between fleets would not be a mere matter of perforating or failing to perforate a restricted area of thick armor. They had a vivid perception of the great tactical principle that concentration of the effect of weapons should be the end aimed at, and that concentration of the weapons themselves is merely the means. Therefore they armed their ships in accordance with the principle. Other nations had to follow their example. The ships launched or designed for our own navy during the last dozen years of the nineteenth century and the first two or three years of the twentieth supply monumental evidence of the reviving but far from dominant influence of tactics.

To follow the course of naval architecture within the last half dozen years would be likely to lead us into contentious questions, which, in a paper like the present, it is best to avoid. Attention, nevertheless, may be properly invited to some aspects of it which appear to reproduce the conditions of the time when the turret ship excluded other types of ship from the fleet. The object then was to obtain great concentration of defensive and offensive material in individual ships, and that object has reappeared of late. Another object was to make the concentration more powerful than any other country had made it. Here, again, we can observe similarity to the aims of the earlier period. The accompanying circumstances now are like those that showed themselves then. There is now, as there used to be before, an oscillation in superiority of material power as exhibited in the augmented displacements and weights of guns. Today one country has the bigger ships and heavier guns; tomorrow this kind of superiority has gone to some other country, which, in its turn, will be surpassed in these things. The important question that we have to face is this: Is the oscillation due to recognition of tactical principles, or is it a contest in architectural development? That question,

we may be sure, will be answered, if not by this generation, then by a future one, and the ships which the great navies of the world are adding, and have lately added, to their lists will remain, whether or not as efficient components of a fighting fleet, at any rate, as monuments to show the world the extent to which, at this present day, the principles of naval tactics found adequate expression in architectural design.

FIRST PRINCIPLES IN NAVY YARD MANAGEMENT

By Assistant Naval Constructor Richard D. Gatewood, United States Navy.

AUTHOR'S NOTE.

In what follows, the intent to criticise existing conditions is farthest from he wrier's desire. Unfortunately the mere mention of efficiency principles is commonly taken to reflect on the ability and integrity of those responsible for the management. Nothing of the kind is even implied. Rather must this so-called "new" science be looked upon as a new process, a new piece of machinery, a new metal, forcing us all to revise our ideas and our ideals as did the introduction of steam or the electric motor or high speed steel.

A NAVY YARD has recently been defined as a *military establishment* designed to effect repairs to the fleet efficiently and economically. Assuming the above to be entirely correct, there must still be conceded that the repair plant proper, at least in the broad principles that govern its control, presents many points of similarity to an industrial enterprise. There is only one reason for the existence of every such enterprise and that is to make money. In order to do this, considering that such enterprises are practically all conducted under the pressure of severe competition, they should be managed with a high degree of efficiency, and it is for this reason that any investigation into the subject of increased navy yard efficiency should be prefaced by a careful study (1) of the principles underlying industrial efficiency and (2) of the organization, methods and devices used in the best managed plants to put into effect these principles.

"The economical administration of naval affairs must be pointed out and practiced by those in charge or later on be subject to serious attack by others." This sentence forms the second paragraph of a letter, requesting suggestions for a more economical administration of naval affairs, dated March 18, 1905, addressed by the late Paul Morton, as secretary of the navy, to the commandants at the various navy yards. Similar sentences can be found in letters from other secretaries to other commandants; in reports from other secretaries to congress, but the very frequency of its reiteration has by familiarity dulled the appreciation of the fact.

We are in the grip of what might be termed a fiendish cycle. Increasing appropriations mean a greater tax burden. Partly, in order to alleviate this burden, we maintain a high tariff; the tariff is the mother of the trust; the trust is the father of the "gentlemanly understandings" to raise prices. Living at once becomes higher. Slowly, but ultimately, materials and wages increase, and with them the cost of production. But profit must not wane under these conditions and appropriations continue to wax to meet "the growing needs of the country," and so the cycle rolls around.

The prospect would indeed be a gloomy one in navy yards were it not that we already hold the solution of the problem if only we can apply it. It is this: First, adopt what has come to be known as the "functional" type of organization as distinct from the "military" type. By the first is meant the type in which "specialists formulate the underlying principles, instruct as to their application, and relentlessly reveal both their observance and neglect." By the latter is meant that type "in which a chief issues arbitrary orders to his subordinates, expecting them, somehow or other, to execute them." Second, use this organization to introduce modern efficiency principles and methods. Personally I can see no other possible solution. "All else—confusion."

Organization—The Two Types.

Just as there are only two methods of compensation for workmen, day work and piece work, all other systems combining the elements of these two in a greater or less degree, so there are only two types of organization, functional and military; all others being variations of these two combined in different proportions. The first contemplates control by means of accurate knowledge obtained from scientific investigation; the second contemplates control by means of guess work and rule of thumb methods obtained from cursory observation. The first is based on fixed principles and natural laws; the second on the man-made laws. "They should take who have the power, and they should keep who can." The first proceeds directly step by step to a definite end with maximum efficiency in shortest time at lowest cost; the second approximates this result only. The first up-builds, the second tears down. The first is self-perpetuating; the second self-destroying. The first is essentially sound and independent; the second essentially unsound and dependent.

The Military—Military Control Unquestioned.

There are many reasons that make military control of navy yards desirable and *there is not the slightest doubt that in the future, as in the past, military control will be continued.* An industrial establishment, however, conducted along military lines will never reach the *highest* success in an industrial sense, and the absolute necessity for greater efficiency in navy yards demands that the industrial part of the work be treated more as an industrial problem than as a military one and that this part be organized, as far as practicable, along the lines adopted by the most progressive, modern, industrial plants; that is, along functional lines.

The majority of modern plants are, it is true, samples of the military type, and the evolution of this type is readily traced somewhat as follows: The first manufacturer carried it all in his head, put his receipts on one side of the column, his expenses on the other; subtracted the two at the end of the year, allowed a certain amount for the value of stock on hand and material in process of completion, and arrived at his profit,—or loss. Ah, the days of pure joy, the nights of perfect peace of this first manufacturer! No non-producers, no clerks, no cost departments, draftsmen, selling force, superintendents, etc., to worry him.

The old gentleman finally retires and turns over to his son the plant he has built up. Business increases, competitors appear. It becomes necessary to expand the plant, perhaps even to swallow up a few of the competing plants. The son finds the

business getting away from him, the detail is too great, the scope too broad. Right here the wrong begins. What does he do? Does he seek out experts in the case of those details that overburden him, specialists in the case of those he is unable to handle? No, why should he? No one else does. It does not occur to him. He does what others do all around him; he follows what has come to be a world-old instinct; he does what his ancestors did before him; he delegates his power,—or rather let me say, "shuffles off" his responsibility to the shoulders of another. Let me call this other his superintendent. This marvelous man, who knows *all* the details of operation, care and maintenance of the plant, selects his foremen and turns over to them power and responsibility, and they in turn choose their mechanics, passing down to them in the last analysis the power to do the thing the son learned from his father. "Knowledge and ability, desire and interest, become diluted with every spreading step." The workman runs the plant; the man of least experience, least compensation, least time to think. And this, if you please, is the common type, the very type found at present in most commercial plants and in our navy yards.

The Functional.

The whole business of industrial organization along carefully thought-out logical lines of increased efficiency is essentially new. Even in commercial circles it is only within comparatively recent years that any really lasting basic methods of organization and shop methods have been introduced. The adoption of these methods is the result of a set of conditions over which those responsible for their development have had but little control and any investigation into the cause of these conditions takes one deep into the problems involved in the application of the law of diminishing returns, the far-reaching influence of competition, the formation of enormous corporations, controlling directly or indirectly many millions of dollars, the question of capital and labor, and the growth of trade unions, and its corollary in a "minimum wage" with a stipulated amount of work per day. These are only a few of the causes that have combined to produce the present-day efficiency methods whose tremendous worth should be thoroughly recognized, appreciated, accepted and utilized by every member of the engineering profession.

Perhaps the most permanent feature to be found in a study of these methods is specialization. This, however, necessitates the existence or creation of *staff*. "Ah, there's the rub." *Staff* has only a very insignificant place in a military organization and the efficiency engineers who first introduced their methods into plants under a military type of organization soon found the results far below those possible of attainment.

They, therefore, set about to determine upon a form of organization that would render effective their efforts and their methods, and they adopted what has become to be known as the *functional* type. By this it is intended to imply that each man's duties are carefully and minutely classified and functionalized, and limited, moreover, to as few functions as practicable. The man becomes a member of a carefully trained staff of experts, each of whom exists entirely for the benefit of the men below him to supply whatever is lacking in ideals, principles, methods or devices. The foreman is not there to relieve the superintendents of power but to lead and help the workmen. The superintendent is not there to remove the burden of responsibility from the shoulders of the manager but to supplement the foremen. The workman is not there as the tool of the president but rather the president and all his staff at the service of the workman to assist him in each operation, in each difficulty, with the very best expert advice available. This is functional organization.

Why in the name of all that is efficient and progressive in modern engineering did not the first manufacturer choose this type instead of the military? It is so simple, so elemental, so logical. Beside it the military type appears so weak, so indefensible.

Would we think of sending our children to a college in which one professor taught all subjects? Is not the whole course of study at the naval academy laid out along functional lines? Is not each pupil each day instructed by one teacher after another who is, presumably, an expert in his particular line of study? The analogy is clear. There is no more reason to adhere to the military type of organization* in a navy yard than there is in any other similar large manufacturing plant and there is no more excuse for it than there would be for retaining paddle wheels and notch-sights after the propeller and telescope-sight had been invented.

Of what use is it for the government (1) to train executives, (2) to employ high-priced efficiency engineers, (3) to introduce efficiency methods, if the very organization under which these men and methods are to be employed is responsible for the prevailing inefficiencies. To do so is to build on weak foundations, to wash the windows from the bottom, to invite certain failure and ultimately to completely discredit the principles of efficiency.

This change from the military to the functional is radical and will not come at once. Much work of an educational nature will be necessary, habits of thought and points of view of strong men must be changed and to do this, infinite patience and much time are essential, but it *will* come, it *must* come, as the inevitable results of natural law and public opinion.

"There is no doubt that in the near future the people and congress will exact an accounting for the vast sums that will be required for the maintenance of the navy. Within the present decade we shall probably reach a limit of cost for the maintenance of the navy, beyond which the country and congress will not go. It will be demanded that the maximum protection be afforded for this money. * * * * Every officer at present in the service should be made to realize that the time is fast approaching when we shall have reached the limit that can be appropriated for the navy and every dollar saved is a dollar's worth of additional navy, a dollar's worth of additional protection for our country."

*This does not mean military *control*.

Will Remodel Sonoma and Ventura

Announcement was made at San Francisco last week of the intention of the Oceanic Steamship Co. to have the steamers Sonoma and Ventura rebuilt at once, and a contract has been entered into with the Union Iron Works involving the sum of $750,000. Oil burning machinery will be installed in the two vessels and changes to the hulls and machinery are contemplated.

The vessels were built at the Cramp yards in 1901 and were under the supervision of the government officers, being designed for use as auxiliary cruisers. They were on the San Francisco-Australia run for several years and about five years ago were laid up on account of a deficit in earnings, which prevented their competition with the subsidized vessels of the colonies.

The vessels are of steel, of 6,253 tons register, and are equipped with triple-expansion engines capable of

8,500 h. p. They are 400 ft. in length, 50.2 ft. beam and 21.3 ft. deep. They cost originally $1,000,000 apiece. On each ship there are accommodations for 175 cabin passengers and 150 second cabin and steerage passengers.

The maximum speed of the vessels under coal has been 16½ knots, and the engineers who are in charge of the repairs believe that they can beat this with oil as fuel. Tankage capacity for a steaming radius of 10,500 miles will be installed.

Wreck of the Steamship Ramona

AT 8:45 p. m., on Sunday night, Sept. 10, the steamship Ramona, of the Pacific Coast Steamship Co.'s fleet, ran at full speed onto the reef off Spanish Island, which loomed up out of the fog too late to be avoided. The vessel was under the command of Capt. Martin Taafe. She had 72 persons on board, all told, and providentially no lives were lost, but two of the passengers were rather seriously injured in getting into the lifeboats in the heavy swell.

Officers of the Ramona say that, owing to the thick fog prevailing in Chatham Strait, Capt. Taafe brought the vessel along at a very slow speed. He maintained a lookout on the bridge himself, and used every care in navigating his course. The last land sighted was Point Harris, on the Kulu Islands, after which the Ramona was run dead slow; later Coronation Island was picked up on the starboard bow and the course was then changed to clear Cape Decision. It was then that the Ramona's course became doubtful, and in a very short time Capt. Taafe saw the jagged reefs of Spanish Island loom up right under the bow. No time was to be lost, and when the Captain saw that inevitably his vessel must strike, he signaled orders for "full speed ahead" to the engine room.

This order, according to the officers of the steamer, probably meant salvation to all on board, as the Ramona, after striking the reef, instead of sinking back in deep water, bounded clear over the reef and landed beyond in a comparatively shallow lagoon. There she now lies protected by a ledge of the reef, though the heavy swell is gradually grinding her to pieces.

All on board were anxious that a wireless message from the Ramona be sent before the vessel settled, but the operator failed to connect with any vessel or station, and it was not many minutes before the dynamos were put out of commission by the inrush of water. Everything happened so quickly after the vessel struck that there was only about 20 minutes in which the lifeboats could be launched, and the passengers and crew got aboard; after striking the Ramona took such a heavy list to starboard that at first only the port boats could be lowered, but later the starboard boats were shifted from the davits and were used for the accommodation of the passengers. After all hands had left the vessel, Chief Officer Equist set out in a lifeboat in an effort to signal a passing steamer; he succeeded in attracting the attention of the fishing steamer Grant, which vessel immediately sent a wireless message to the steamship Northwestern (of the Alaska Steamship Co.) at Cape Ommaney. The Grant was rushed to Spanish Island as quickly as possible and later the Northwestern arrived in time to take the passengers and crew from the Grant after they had been taken off the island. The former steamer arrived in Seattle at 9:30 p. m., Sept. 15, and landed the wrecked people intact; beyond suffering severely from exposure, none of the passengers or crew underwent hardships, except the two passengers who were injured in getting into the lifeboats.

Capt. J. G. Hunter, of the steamship Northwestern, reports the Ramona a total loss; before he left the scene of the wreck her deck house had been washed away, and nothing but her masts and smokestack could be seen. A portion of her bottom is torn completely off; it was seen floating near the surface. All of the Ramona's baggage was lost, and her treasure of $150,000 in gold bullion, with a salmon cargo worth $45,000 is probably still in her hold. Three divers with apparatus have been sent north to recover the gold bullion and salve all they can.

The Ramona was a wooden screw steamer with three decks, 1,061 tons register, built by J. W. Dickie, of Alameda, Cal., in 1902. Length, 195 ft.; beam, 32 ft.; draught, 15 ft. 7 in. The vessel was engined by the Risdon Ironworks, San Francisco, with triple-expansion engines having cylinders H. P. 16 in.; M. P., 28½ in.; L. P., 44 in.; by 33-in. stroke.

According to a report received in Seattle, Sept. 22, approximately $150,000 in gold bars and gold dust have been recovered from the wreck of the Pacific Coast Steamship Co.'s liner Ramona. In addition to the gold, a small part of the mails and baggage and a quantity of canned salmon has been recovered by the salvors, who have been working under the direction of Capt. Ernest McNoble, superintendent of the company.

The report which has been received would seem to indicate that all the upper works of the wrecked vessel have been swept away by heavy seas, and that her hull is broken in two amidships. In any case the vessel is a total loss, and has now been abandoned, and officials of the company believe it will be impossible to recover anything more from the wrecked vessel.

Loss of the Gunilda

The loss of Wm. L. Harkness' yacht, the Gunilda, was one of the most singular that has happened on the lakes. This yacht stranded on a reef in Nipigon Bay, north of Copper Island, and the tug James Whalen with a wrecking crew outfit was sent to her relief from Port Arthur. The Gunilda was found to be resting on the reef about 80 ft. from the stem, at which point there was about 5 ft. of water. The fore end of the keel was out about 5 ft. and about 80 ft. of the forward part of the yacht was unsupported. The yacht was drawing water aft well up to her deck, but was resting easy. The wreckers began operations about six o'clock on the morning of Aug. 31, carrying a 12-in. hawser around the yacht, passing through the hawse pipe and being fastened to the fore bitts. The wreckers' steel towing cable was made fast to the after end of the hawser and two other lines were made fast to the wrecking tug's bitts and the after bitts of the Gunilda on each side. An attempt was made to pull the vessel astern without success, but the Gunilda's stern swung somewhat to port. When the lines were readjusted and further effort made to pull her astern, instead of leaving the reef she listed heavily to starboard, submerging her bulwarks and filling the house and after end with water. In about 15 minutes it was observed that the extra weight aft was gradually lifting the bow into the air and in a little while she slipped over the reef, stern first, and disappeared in 300 ft. of water. All that was saved was the portable equipment on deck which floated off as she went down, including naphtha launches, cutter, sail boat and dinghey and steamer chairs.

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A Public Spirited Enterprise

The Atlantic & Pacific Transport Co. was incorporated at Trenton, N. J., last month by experienced steamship men for the purpose of bidding on the contracts for carrying the mails between New York and Colon, New Orleans and Colon, and San Francisco and the City of Panama, as now being advertised by the postmaster general. The capital stock of the new company is $15,000,000 and it is announced that the company intends to build a fleet of at least fifteen steamers for this service. The leading spirit is Bernard N. Baker, former president of the Atlantic Transport Line before its merger into the International Mercantile Marine Co., more commonly known as the Morgan combine. His associates are James S. Whiteley, T. B. Harrison, who were associated with him in the Atlantic Transport Co., and Adrian H. Boole of Washington, D. C., at one time one of the managers of the Wilson Line. Men more competent for the projection of such a service could not be secured. The organization of this company is the first step in preparation for the commercial use of the Panama canal, as the company intends to maintain a regular schedule between the principal ports of the Atlantic and Pacific seaboards. Assurances have been given out that the ships will be ready when the canal is opened for traffic.

Mr. Baker has devoted more study to the utilization of the canal than any other person interested in shipping. In 1908 Mr. Baker was asked by the secretary of war to ascertain why the prospective trade benefits by the canal were not being taken advantage of in the United States. Mr. Baker made a trip to the Isthmus and submitted his conclusions in a statement which is now a public document. In his report Mr. Baker stated that the transcontinental railroad pool had been paying $1,000,000 a year to the Panama Railroad Co. to suppress water competition by way of Panama and that one of the ways that the Panama Railroad accomplished this purpose was by not building its line to deep water. The postmaster general in his instructions to bidders for these mail contracts has decided that no contract will be awarded "to any bidder who shall be engaged in any competitive transportation business by rail." The charter of the Atlantic & Pacific Transport Co. accordingly contains this provision:

"No person shall be eligible as a director who shall be a director in, or an officer or agent of, any corporation or association engaged in any competitive transportation business by rail."

The coast to coast traffic was estimated to be about 3,000,000 tons two years ago and to be increasing at the rate of about 10 per cent per annum. This would mean an available traffic of approximately 4,200,000 tons when the canal is opened to deep water navigation.

It is stated that the new vessels will be constructed with a view to the service which they are intended to perform. Special apparatus will be installed to keep the temperature even throughout the ship in the temperate and tropical climates through which they will pass. It is expected that the cost of transportation will work out at about two-thirds of the present railroad rate, so that the route ought to offer inducements to tourists. The government is now building large piers and warehouses at the canal terminals, the plans for which were suggested by Mr. Baker and ratified by the Isthmian Canal Commission.

Statistics reveal the fact that within easy distance of Colon and Balboa are 14,000,000 people whose trade represents the sum of about $135,000,000 per annum. Of this sum, however, a very small part, about $27,000,000, represents the import and export trade with the United States. In other words our neighbors buy 64 cents worth of stuff per capita with us and spend $3.58 per capita in foreign countries, notwithstanding their comparative remoteness. It is in order to meet this situation that the Atlantic & Pacific Transport Co. intends to inaugurate a system of seagoing

barges to operate up and down the coast of these countries, penetrating their rivers and connecting with the main line over the canal terminals. There certainly exists here a wonderful commercial field which should be conserved to the American ship.

The Mississippi

The Mississippi may not be the most wonderful river in the world, but it probably has more original characteristics and more individuality than any other stream. To begin with, it is crooked as a pig's tail and as contrary as a mule. If one considers the Missouri to be its main branch, it is the longest river in the world—4,300 miles. It discharges three times as much water as the St. Lawrence, 25 times as much as the Rhine and 338 times as much as the Thames. It ambles through a drainage basin the area of which is greater than the combined areas of England, Wales, Scotland, Ireland, France, Spain, Portugal, Germany, Austria, Italy and Turkey. It carries with it to the sea the supply of 54 rivers that are navigable by steamboats and hundreds that are navigable by flat boats and barges. It is distinguished in that, unlike most rivers, it narrows instead of widens at the mouth. Its width steadily diminishes and its depth increases as it approaches the sea. Engineers estimate that it dumps annually 406,000,000 tons of mud into the Gulf of Mexico. This enormous deposit of course extends the land, but only slightly, having made but a third of a mile in 200 years. It seems to resent its own crookedness because it is forever straightening itself out by cutting through narrow necks of land. More than once it has shortened itself 30 miles at a single jump. The effect of this disposition on the part of the river is sometimes quite embarrassing, many a man having gone to bed in the state of Mississippi to wake up in the morning in the state of Louisiana. Several towns that were once thriving river towns are now inland towns with the river flowing peacefully several miles away from them. The town of Delta used to be 3 miles below Vicksburg. A cut-off occurred and Delta is now 2 miles above Vicksburg.

But probably the most curious of the river's habits is its tendency to move bodily sidewise. At Hard Times, La., the river is 2 miles west of the region it used to occupy, with the result that the original site of the settlement instead of being in Louisiana is now in Mississippi. It is stated that practically the whole of the 1,300 miles of the river that La Salle traversed 200 years ago is now dry ground. The river lies to the right of it in places and to the left of it in others.

Absence of the Flag

Hon. Wm. C. Redfield, vice president of the American Blower Co., of Detroit, is also representative in congress for the fifth district, New York City. Last spring he cut short a trip around the world in order to attend the extra session of congress. Mr. Redfield went far enough on the trip, however, to be profoundly impressed with the absence of the American flag in foreign ports. When he reached Bombay he wrote home to tell his company what he thought about it. What he thought is very much to the point indeed and brings home quite clearly our folly and extravagance in permitting other nations to do our carrying. This fact has been pointed out time and time again, but never quite so clearly as in Mr. Redfield's letter, which is published herewith.

"It is an oft-told tale that the American flag on merchant vessels has gone from the seas, and it is a fact that while I have seen two steamers carrying the flag of Sarawak and 20 with that of Portugal, I have not, since leaving Japan, seen an American flag. I am not so much concerned about this as a matter of personal pleasure or patriotic pride, but it has been brought home to me that it is a matter of serious loss. Not, I mean, loss merely to the transportation and ship building business that is directly involved, but the far more serious loss that you yourselves suffer and all your fellow manufacturers, and to which, amid your many cares, you have doubtless given little thought. In our American public discussion of this theme, the ship builders and the ship owners and possibly our railways have been assumed to be parties concerned and our general public has wasted little sympathy on them. But while these may be the direct interests involved, the indirect interests are vastly greater and more important.

"These indirect interests are you and your fellow manufacturers in Detroit and in Chicago and St. Louis and elsewhere. You and they are poorer because the American flag is not seen on the high seas. You employ fewer men and use less machinery or work fewer hours and make less money because of that fact. This is what I want you not only to read but to realize, to grasp and act upon.

"Suppose Detroit were so placed that every shipping line from it was owned and controlled by her business rivals. How could she then get trade away from Chicago or St. Louis or compete with them? For not only would every shipment Detroit made pay a profit to these rivals, but the time and speed and frequency of the shipments would depend on their wills. Detroit might in such case, by the energy of her men and by their initiative and astuteness, still do a good trade, but you will agree with me that the condition I sketch would be a serious, nay a disastrous handicap.

"Now this is the substantial fact as regards the foreign trade of the United States. We must have that foreign trade. To lose it would be a disaster. But almost every box and bale sent abroad not alone pays tribute to a rival's purse (which is the least of it) but—and here is the grave fact—the course that box or bale travels, the provision of sufficient and frequent means of sending it at all, these, all these, are not only in the hands of your business rivals but are deliberately and skillfully used in their favor and to your business injury. True, some lines want our trade and say they cater to it, but no English or German line but will give preference to its own nationals, and there is almost no one to give preference to Americans.

"When I sold an engine in Rangoon, I was told there was a three weeks' handicap in time against us as compared with England and that our engines would have to go to Birkenhead and be transferred there. There were no American ships regularly sailing to Rangoon and no way in which you could avoid the handicap of three weeks time and an extra freight charge. Fortunately, the excellence of our engine got us a start,

but the handicap is there working while you sleep. And this same handicap ties itself to a more or less degree to every quotation made abroad by every American manufacturer.

"I do not write in advocacy of any special form or measure of relief but only to do certain simple things, viz.: (1) To bring the facts home to those most interested, (2) to suggest that it is high time the "Age of Talk" ended and the "Age of Action" began.

"Cannot we be patriotic and wise enough to drop this, that, or the other preference and agree on something that will give to our manufacturers and their workmen the share of the world's trade to which they are entitled? This would be a righteous and a reasonable protection."

Commonwealth Steamship Co.'s Suits

IN LAKE circles the topic of greatest interest during the month has been the inquiry into the commissions received by William A. and Arthur H. Hawgood for promoting the construction of vessels operated by them on behalf of the Commonwealth Steamship Co. and the Acme Transit Co. In fact, wherever vessel men have congregated they have talked of little else, and the newspapers have likewise been filled with stories more or less inaccurate. The storm has been brewing for several months, but during the last month has reached cyclonic proportions with the wind apparently blowing from every direction. The first indications of it appeared when seven vessels were withdrawn from the Hawgood management and merged into the Commonwealth Steamship Co. These seven vessels were the Wm. A. Hawgood, J. Q. Riddle, A. H. Hawgood, Sheldon Parks, Abraham Stearn, H. A. Hawgood and W. R. Woodford.

Frank P. Whitney, a stockholder in the Commonwealth Steamship Co., brought suit against the Hawgoods for an accounting, making the Commonwealth Steamship Co. party defendant. Depositions were taken before Griswold & White, attorneys, but the Hawgoods refused to answer specific questions until the common pleas court ruled that they would be in contempt unless they did so. Arthur H. Hawgood thereupon testified that he and his brother, William A., had received commissions from the American Ship Building Co. upon the Commonwealth steamers as follows: A. H. Hawgood, $30,000; W. R. Woodford, $30.000; Sheldon Parks, $25,000; W. A. Hawgood, $25,000; Abraham Stearn, $15,000, and J. Q. Riddle, $5,000. The remaining vessel of this fleet, the H. A. Hawgood, belonged to a company promoted by Henry A. Hawgood, deceased, and no testimony was submitted concerning this steamer.

President James C. Wallace, of the American Ship Building Co., testified that he could not recall that the Hawgoods had received any commissions, although not denying the possibility that they might have received them. He added that it was the practice of the company to destroy all records over two or three years old, and he presumed that they had been destroyed.

"I don't remember having handed any checks for commissions on boats built by my company to either of the Hawgoods," said Mr. Wallace.

"Do you deny entering into any arrangements with either of the Hawgoods relative to the payment to them of commissions on steamers contracted for by them?" was asked.

"I don't deny anything," replied Mr. Wallace, "I merely don't remember, that is, I can't recollect."

William A. Hawgood followed Mr. Wallace and corroborated the testimony of his brother Arthur to the effect that they had received commissions aggregating $130,000 on the six steamers of the Commonwealth Steamship Co.'s fleet.

Immediately following the testimony of the Hawgoods, F. P. Whitney's suit against them was withdrawn and the American Ship Building Co. itself became the center of attack. The Commonwealth Steamship Co. formally tendered the steamers back to the American Ship Building Co., and demanded the restoration of the contract price.

Two of the steamers, however, the A. H. Hawgood and the W. R. Woodford, had been sold through Babcock & Penton, naval architects, to interests associated with the Inland Steel Co. the very day before Arthur Hawgood submitted his testimony as to commissions. These two steamers had completely passed out of the possession of the Commonwealth Steamship Co., and its attorneys held that its equity in them consisted in the difference between the contract price and the sum which the American Ship Building Co. actually received for building them. Five bills in equity were then filed in court to compel the ship building company to take back the steamers William A. Hawgood, J. Q. Riddle, Sheldon Parks, H. A. Hawgood and Abraham Stearn. A few days after filing these bills, negotiations were entered into with the Commonwealth Steamship Co. for the purchase of two additional steamers. The Commonwealth Steamship Co.'s financial necessities were apparently so great that it withdrew two bills in equity covering the steamers Henry A. Hawgood and William A. Hawgood, selling the Henry A. Hawgood to Capt. W. C. Richardson, of Cleveland, and the William A. Hawgood to R. L. Ireland, of the firm of M. A. Hanna & Co., of Cleveland, for the sum, it is understood, of $225 000 each. It was necessary to withdraw these bills in order to give the purchasers a clear title to these two steamers.

Suits were subsequently filed in common pleas court against the American Ship Building Co. and the Hawgoods to recover sums of money on three of the four steamers which it sold, namely the A. H. Hawgood and W. R. Woodford, to the Inland Steamship Co., and the W. A. Hawgood to M. A. Hanna & Co. It is understood that a fourth suit is also to be brought covering the steamer Henry A. Hawgood, sold to Capt. W. C. Richardson. The sum asked for on account of these three vessels is $189,935 and interest, the total sum being approximately $275,000. As noted, the Hawgoods testified to having received $85,000 in commissions on these three steamers, but the attorneys for the Commonwealth Steamship Co. represent that, regardless of commissions, the contract price was excessive, based upon the sums actually paid by other vessel owners for new construction at the time these steamers were building, and they seek to recover the excess.

The withdrawal of the Commonwealth Steamship Co.'s steamers from the Hawgood management left the Hawgoods still with ten steamers which a few months ago were incorporated into the Acme Transit Co. The fleet of the Acme Transit Co. consists of the following vessels: J. M. Jenks, Bransford, Edwin F. Holmes, Umbria, Wisconsin, Etruria, Harvey D. Goulder, H. B. Hawgood, Henry B. Smith and Salt Lake City. The Etruria, Goulder, H. B. Hawgood, Umbria and Wisconsin were controlled by companies organized by

Henry A. Hawgood, deceased. The Jenks, Bransford, Holmes, Henry B. Smith and Salt Lake City were operated by companies formed by W. A. and Arthur H. Hawgood. It was quite natural that the stockholders of the Acme Transit Co. should follow the lead of the Commonwealth Steamship Co. In fact, exactly the same plan of attack is being followed. Cleo H. Troxel, stockholder, has brought suit against W. A. and A. H. Hawgood, naming the Acme Transit Co. as party defendant to recover what, if any, commissions were paid upon the construction of vessels in this fleet.

In this action the first witness called was Russell C. Wetmore, vice president and treasurer of the American Ship Building Co. Mr. Wetmore's testimony was quite simple and direct. Concerning the vessels of the Acme Transit Co.'s fleet he could not recall that any commissions had been paid to the Hawgoods on their construction. He was not prepared to deny that any commissions had been paid, but he could not remember that any had been. Part of this fleet was built as early as 1902, and he said that such transactions were too far back for his memory; nor could he find in the files of the Ship Building company any papers relating to the subject. He testified, however, that certain papers which he believed involved dealings with the Hawgoods had been delivered to the company's counsel, James H. Hoyt, in the summer of 1911. He was quite certain that the papers had been delivered to Mr. Hoyt prior to the beginning of the Whitney suit. Upon being asked where the papers were now he replied that Mr. Hoyt had informed him that very morning that W. L. Brown, chairman of the board of directors of the American Ship Building Co., had demanded them and that they had been forwarded to him. When asked if he could obtain possession of the papers, he replied that Mr. Brown was his superior officer and was in charge of the records of the company. Asked if he had examined the papers, he replied that he had inspected them only in a casual way, but had made no memoranda of what they were. Upon being asked if the Hawgoods had obtained any commissions on any of the vessels built for them (which of course would include vessels constructed for the Commonwealth Steamship Co.) he believed that they had obtained commissions on some. He could not, however, state how many times they had received commissions nor upon what vessels nor the amount of the commissions, adding that while he made out none, he signed many hundreds of checks in the course of a month and could not be expected to remember individual sums. He testified that he never had any conversation with any of the Hawgoods regarding any commissions.

Later in the same day Arthur H. Hawgood was called and testified that he and his brother, William A., had received the following commissions on vessels now enrolled in the Acme Transit Co.: J. M. Jenks, none; Bransford, none; Edwin F. Holmes, $17,500; Henry B. Smith, $15,000; Harvey D. Goulder, $5,000; Salt Lake City, $25,000; a total of $62,500. The construction of the Goulder was promoted by Henry A. Hawgood, deceased, but his brother stated that as he was ill at the time they looked after his affairs. No admissions were submitted concerning the remainder of Henry A. Hawgood's fleet.

The hearing was then transferred to Chicago. An effort was made to have W. L. Brown, chairman of the board of directors of the American Ship Building Co., turn over the papers which Mr. Hoyt had forwarded to him. It is understood that Mr. Brown, who was represented by Homer H. McKeehan, of Cleveland, has offered to produce the papers providing that the evidence secured from them be used entirely in possible suits against the Hawgoods and not against the Ship Building company. In fact, during the examination of Mr. Wetmore, Mr. McKeehan offered to send Mr. Wetmore to Chicago to obtain the papers if the prosecution would agree not to use them as a basis for action against the Ship Building company. This offer was, of course, declined. It is now understood that legal action will be begun in federal courts to compel the production of the papers.

The outcome of this varied litigation will be watched with the keenest interest. It has been common talk in the trade for several years that certain promoters of independent vessels were shaking down the plums pretty generously. As is well known, the result of their efforts has been the overstocking of the market with ships to the general demoralization of the carrying trade.

The general temper of the trade is to hold the ship builder blameless for the situation, but little sympathy is expressed for the promoter, who, through the creation of tonnage for which there could be no steady market, has transferred a business, fundamentally sound, into a hazardous undertaking. In the case of the Hawgoods, it develops from the records of the Commonwealth Steamship Co. that the steamship company paid them a bonus of $5,000 on each ship for their services in securing stock subscriptions and negotiating for the construction of the vessels.

Other suits are pending against the Hawgoods concerning their relations as managers of the Commonwealth vessels. It develops that 10 per cent of the insurance premiums was withheld by them on the ground that they were insurance agents and were therefore entitled to the insurance commission on the premium. As the insurance premium on steamers of the Commonwealth Co.'s type is approximately $20,000 per annum, the 10 per cent represented $2,000, or $14,000 per annum on the fleet of seven vessels. The Commonwealth Steamship Co. maintains that the Hawgoods were salaried officers of the company and were not entitled to any rebates independently.

Maiden Trip of the Schoonmaker

The bulk freighter Col. James M. Schoonmaker left the Ecorse yard of the Great Lakes Engineering Works on her maiden trip, Sunday, Oct. 8, going to Toledo to load coal. A party consisting of Col. J. M. Schoonmaker, vice president of the Pittsburgh & Lake Erie railway; C. D. Dyer, vice president of the Shenango Furnace Co.; J. B. Yohe, general manager of the Pittsburgh & Lake Erie Railway Co.; Henry Irvin Jr., treasurer of the Shenango Furnace Co., and G. B. Obey, superintendent of the Pittsburgh & Lake Erie railway, came on from Pittsburgh in Col. Schoonmaker's private car to take part in the maiden trip. They were certainly delighted with everything they saw and had good reason to be. THE MARINE REVIEW will, in its November issue, give a complete description of this fine steamer. The Schoonmaker was saluted by every vessel passing her on her journey to Toledo. She is not only the largest bulk freighter on the lakes, but is said to be the largest steamer in the world designed exclusively for carrying freight in bulk. She is 617 ft. over all, 597 ft. keel, 64 ft. beam and 33 ft. deep. Stages of water are low this year and she probably will not be able to make any cargo records, but as soon as mean depth is again attained the Schoonmaker will undoubtedly break all cargo-carrying records. Her beam is four feet greater than any freighter on the lakes, and

of course she can pass only through one lock at the Sault. She will really not be able to avail herself of her enormous carrying capacity until the third American lock, now under construction, is finished. Her beam makes her quite easy in a sea and she handles very readily.

The Schoonmaker has quadruple-expansion engines and three Scotch boilers, and her auxiliary features are many. In keeping with Mr. Snyder's policy, her quarters for the entertainment of guests are very elaborate.

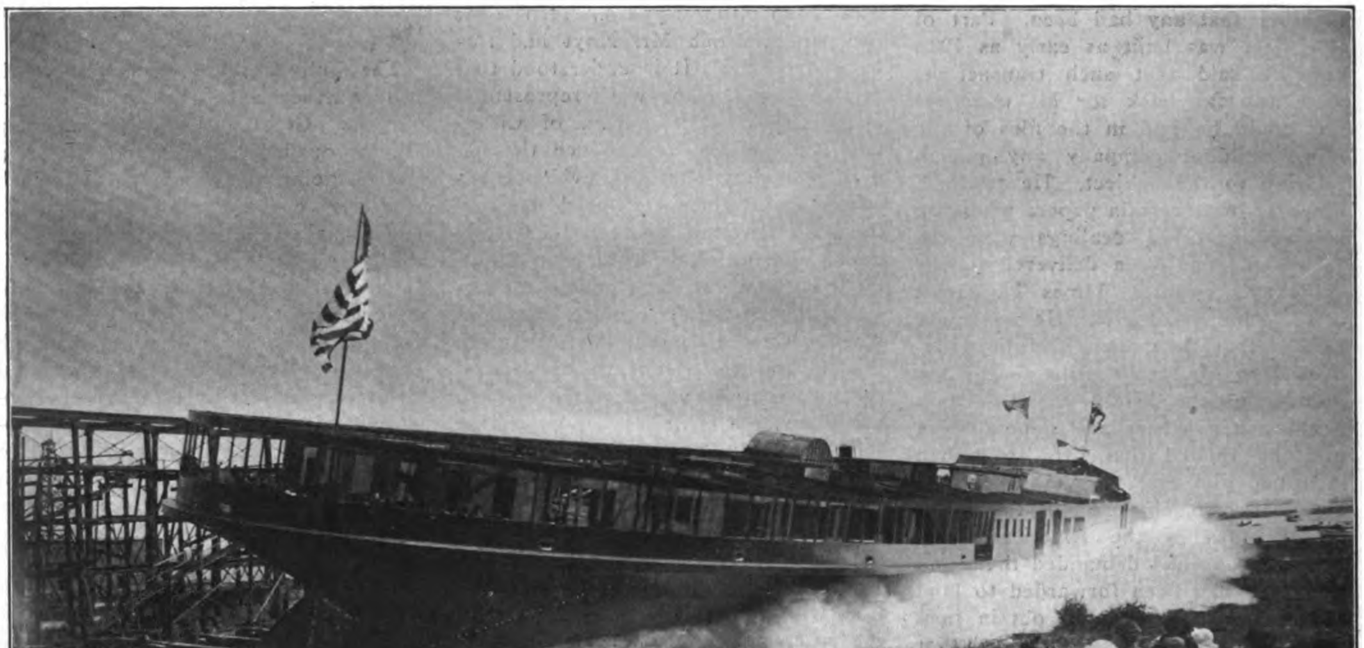
CITY OF DETROIT III LAUNCHED

THE sidewheel passenger steamer, City of Detroit III, building for the Detroit & Cleveland Navigation Co., was launched from the Wyandotte yard of the American Ship Building Co. on Saturday, Oct. 7, and was christened by Miss Doris McMillan, daughter of the late W. C. McMillan, former president of the line. The launch was under the auspices of the Detroit board of commerce and was made a gala event by the city of Detroit, many thousands attending. The invited guests were conveyed to the ship yard on the steamer Britannia, but thousands also reached the yard in automobiles, in street cars, and on foot.

The new steamer is not only the largest sidewheeler on the lakes, but she is the largest in the world, and until the harbors of the great lakes are extended no steamer of greater dimensions can be used on the lakes. The City of Detroit III is 472 ft. in length, or 68 ft. longer than the City of Cleveland, and will have 62 more state rooms than the City of Cleveland. She is of 55 ft. molded beam, 93 ft. over guards and 22 ft. molded depth.

The hull is divided into 11 compartments by watertight cross-bulkheads extending from the keel to the main deck. The bottom is divided at the center line and athwartships into 15 watertight tanks. There are two decks below the main deck and three above. Steel has been employed quite largely in the superstructure. The main engine is of the three-cylinder, compound inclined type, having one high pressure cylinder 62 in. diameter and two low pressure cylinders 92 in. diameter, with a piston stroke of 102 in. The design of engine is exactly similar to that which has given such remarkably efficient service on the City of Cleveland, except that it is larger and more powerful. Steam will be supplied from four double-ended and two single-ended Scotch boilers.

The decorative scheme has been en-



LAUNCHING STEAMER CITY OF DETROIT III, AT THE WYANDOTTE YARD OF THE AMERICAN SHIP BUILDING CO.
Photo copyrighted 1911 by Detroit Publishing Co.

trusted to Louis O. Keil, who has done all of the decorative work of the line for many years. The lobby, which will, as usual, contain the purser's and steward's offices, telephone booths, elevators and parcel rooms, will be in the Doric style of architecture with massive marble columns and pilasters with bronze capitals and bronze supporting the heavy beam ceilings and cornices in mahogany. The walls will be paneled in solid Spanish mahogany inlaid in marquetry of ebony, holly and vermilion woods. The ceiling decorations will be in bronze and verd-antique. The furniture will be covered in green leather in harmony with the decorations. Much study has been given to the lighting, which consists of heavily carved bronze brackets and standards.

Abaft the lobby will be the main dining room, 90 ft. deep and the full width of the ship with accommodations for 300 people. The walls of the dining room will be wainscoting in old colonial mahogany 3 ft. 6 in. high with paneling in old ivory. All the decorations in the dining room will be distinctly colonial in character. The buffet will be located under the dining room, the general scheme representing a cloister cellar on the Rhine with hogsheads of German manufacture. The main saloon will be in Corinthian design and will be embellished with mural paintings of a character similar to those on the City of Cleveland. Added features will be a palm court in pure white and a lounge room of noble proportions designed in Gothic style.

There will be 20 parlors or suites or rooms with private bath. Every state room will have running water and telephone connections to the office, enabling shore connections to be made with every state room while in port. There will be a perfect ventilation system to automatically change the air in every state room without creating a draught. An automatic fire alarm system will also be installed to reach all parts of the ship.

Her auxiliary gear includes an Akers steam steerer.

The launch was attended by quite a representative gathering of steamship men, including George A. White, assistant general manager, and Alfred B. Olcott, treasurer of the Hudson River Day Line; E. W. Thorpe, general manager of the Goodrich Line, of Chicago; H. H. Gildersleeve, general manager of the Northern Navigation Co,; Charles J. Smith, president and general manager of the Richelieu & Ontario Navigation Co.; J. C. Evans, general manager of the Anchor Line; T. F. Newman, general manager of the Cleveland & Buffalo Transit Co.; F. C. Cruger, of the Northern Steamship Co., Buffalo; D. C. McIntyre, general freight agent of the D. & C. Line, Cleveland, and George T. Arnold, of the Arnold Line, Mackinac Island.

Mitchell—Mack Collision Case

Charles M. York and Charles M. Gooding, United States local inspectors at Marquette, have rendered their decision in the case of the collision between the steamers John Mitchell and Wm. H. Mack, which occurred near Whitefish Point, July 9, and which resulted in the sinking of the Mitchell with her cargo of coal and the drowning of three members of her crew. The six passengers aboard the Mitchell had narrow escapes. The decision is as follows:

Upon conclusion of our investigation of the case above designated we find the important facts in connection therewith to have been as follows:

1. That meeting on the course between Whitefish Point and Manitou Island, Lake Superior, at a point approximately 7 miles from Whitefish Point, the steamers John Mitchell and William H. Mack collided, with the result that the former vessel went down in deep water about seven minutes thereafter, the lives of the second mate and two members of the crew of the sunken ship being lost by drowning.

2. That the steamer John Mitchell was en route to Duluth with a cargo of coal, whereas the steamer William H. Mack was bound down without cargo.

3. That the collision occurred at about 11 o'clock on the night of July 9, 1911, and that then, and for several hours previous thereto, a dense fog enveloped at least all the southeastern portion of Lake Superior, with a very light south wind prevailing.

4. That each of the respective steamers had on board the full required complement of officers and crew, and that at the time of, and for several hours prior to the collision, Capt. John Massey was in charge of and directing the navigation of his steamer, the John Mitchell, while Capt. George H. Burnham was likewise in charge of and directing the navigation of his steamer, the William H. Mack; and, that aboard each steamer there was a lookout constantly on watch, and that the second officers, or second mates (so-called), of the respective steamers were also on watch.

5. That the steamer Mitchell encountered fog at 9 p. m., when about abreast of Parisian Island, at which time the steamer's fog whistle was blown and the engine checked to 58 turns, giving the vessel a speed not to exceed 7 miles per hour; and, although dense fog was not run into by the Mitchell until after rounding Whitefish Point, the steamer was navigated at the above specified reduced speed, and at such speed only, from the time of checking at 9 p. m. until the steamers came together. Further, the fog signals of the steamer Mitchell were blown regularly up to within four or five minutes of the collision, or up to the time of hearing the first fog signals of the steamer Mack.

6. That the steamer William H. Mack encountered dense fog at 1:50 p. m., when about 16 miles east, southeast of Manitou Island, whereupon the sounding of fog signals was promptly commenced. The speed of the Mack, however, was not reduced upon entering the fog, but, on the contrary, such steamer was navigated at her ordinary full speed (which was figured at 12 miles per hour when light, as at the time under consideration) until within 400 or 500 feet of the Mitchell, with the single exception of checking for about two minutes when meeting some unknown steamer head-on about three o'clock in the afternoon.

7. That after the fog signals of the Mack had been heard aboard the Mitchell and vice versa, which appears to have been a matter of four minutes before the occurrence of the disastrous collision, passing signals were blown by both steamers, as to which the evidence conflicts to a most irreconcilable extent—Captain Burnham testifying that he blew the Mitchell four one-blast passing signals, and none other (except certain fog whistles blown between the passing signals), without receiving any passing signals whatsoever in reply from the Mitchell; whereas, Captain Massey maintains that he exchanged from four to six passing signals of two blasts with the Mack. The evidence of both masters is corroborated by that of their respective crews.

It is conceivable that the evidence given on both sides covering this point be substantially true, as the fact of the aberration of sound at times in a dense fog is a well recognized phenomenon of peculiar interest to navigators, and one the influence of which is to be reckoned with by them as best may be.

We do not, however, deem it essential that we attempt to analyze or to definitely pass upon this particular part of the testimony. The fact re-

mains that the steamers met in a most unfortunate collision owing, primarily, to the violation of Rule XIV, Pilot Rules for the Great Lakes, by both Capt. Massey and Capt. Burnham—the former in failing to check his boat to bare steerageway upon hearing the fog signals of the Mack, thence navigating with caution until the vessels had passed each other, and Capt. Burnham for the same violation, and for the further reprehensible and inexcusable violation of the first part of the said Rule XIV of the Pilot Rules, viz.: Navigating the steamer William H. Mack at her ordinary full speed in a dense fog. This was not a temporary violation, but, with one brief exception, hereinbefore noted, a continuous violation on the part of Capt. Burnham covering a period of some nine hours.

In consideration of all the foregoing, we have this day suspended the master and first class pilot's license of Capt. John Massey for a period of 30 days for the violation of the second provision of Rule XIV, Pilot Rules, as above set forth; and, inasmuch as Capt. Burnham violated both provisions of the pilot rule specified, and that the fact of the steamer Mack being navigated at full speed, as above recorded, was, in our judgment, quite largely responsible for the excessive seriousness of the collision, we have this day suspended his license as master and first class pilot for a period of 12 months, both suspensions effective on and after Oct. 1, 1911.

Ore-Loading Record

The steamer William E. Corey loaded 9,457 gross tons of Group 5 ore at the Allouez dock, Superior, Wis., in 25 minutes on Sept. 8. The Corey made no shift and the ore was all in the pockets. In loading the boat 12 men worked at the door of the pockets and 18 men on top of the dock. The time of loading was computed from the time the first spout was started to be lowered to the hatch and ended when the last spout was back in its place at the dock. The Corey arrived at the Allouez dock at 1:40 p. m., Sept. 8, and was ready to load with water out at 2:43 p. m. Loading began at 2:43 p. m., and was concluded at 3:08 p. m. She left the dock at 3:15 p. m. The total time loading was 25 minutes and the total time at dock and in port was 1 hour 35 minutes.

Commerce of Lake Superior

The commerce of Lake Superior during September, as measured by the canals at Sault Ste. Marie, totalled 7,949,844 tons, a decrease of 598,968 tons, compared with the August movement, which was 8,548,812 tons, the heaviest of the year. The movement to Oct. 1 amounts to 39,438,167 tons, as against 48,837,174 tons for the corresponding period during 1910, a decrease of 9,399,007 tons. Following is the summary:

	To Oct. 1, 1910.	To Oct. 1, 1911.
EAST BOUND.		
Copper, net tons........	95,653	83,312
Grain, other than wheat, bushels	25,202,054	21,912,198
Building stone, net tons	8,365	4,367
Flour, barrels	4,766,452	4,579,336
Iron ore, net tons......	34,282,282	23,652,487
Pig iron, net tons......	23,411	25,596
Lumber, M. ft. B. M...	472,614	403,644
Wheat, bushels	40,771,839	41,043,359
Unclassified freight net tons	119,793	101,169
Passengers, number ...	29,483	35,054
WEST BOUND.		
Coal, anthracite, net tons	1,209,289	1,485,087
Coal, bituminous, net tons	8,896,296	10,079,890
Flour, barrels	1,110	125
Grain, bushels	2,153	1,100
Manufactured iron, net tons	289,519	275,949
Iron ore, net tons.....	....	12,622
Salt, barrels	427,248	480,277
Unclassified freight, net tons	871,261	882,971
Passengers, number	32,711	39,523
SUMMARY OF TOTAL MOVEMENT.		
East bound, net tons...	37,507,279	26,630,196
West bound, net tons..	11,329,895	12,807,971
Total	48,837,174	39,438,167

was 13,833, and the net registered tonnage, 30,-

The total number of passages to Oct. 1, 1911, 963,812.

Overrun in Grain Cargo

The steamer Edwin F. Holmes of the Hawgood fleet which loaded wheat at Chicago had an overrun of 1,299 bushels when she unloaded at Buffalo. The shippers immediately notified the owners that a mistake had been made in weighing out the cargo on account of defective scales and that the boat would not get the benefit of the extra amount carried as is the custom. The business of carrying grain has always been an unsatisfactory one to vessel owners. The boat has always been held liable for any shortage occurring in the cargo, the vessel owner having to make up the deficiency out of his own pocket. The grain shippers and banking interests held that this proceeding was absolutely necessary in order to make the bill of lading a negotiable instrument, maintaining that overruns would about equalize shortages anyhow. The natural tendency, however, is toward shortages, which may occur in a variety of ways for which the owner is by no means responsible. The shortages certainly are more numerous than overruns. In this instance, however, where a serious overrun has occurred the shipper appears to be quite anxious to have it rectified. It therefore should be only fair to the vessel that when a serious shortage occurs it should be rectified.

Lake Erie Ore Receipts

Iron ore shipments during September were 5,231,069 tons, of which 4,065,668 tons came to Lake Erie ports, distributed as follows:

Port.	Sept., 1911.
Buffalo	343,598
Erie	36,026
Conneaut	1,246,181
Ashtabula	1,065,020
Fairport	116,684
Cleveland	633,240
Lorain	455,448
Huron	46,238
Sandusky	......
Toledo	92,533
Detroit	30,700
Total	4,065,668

Iron Ore Shipments

Iron ore shipments during September were 5,231,069 tons as against 6,273,823 tons for the corresponding month last year, a decrease of 1,042,763 tons. The movement to Oct. 1, 1911, was 24,837,137 tons, as against 35,100,864 for the corresponding period last year, a decrease of 10,263,727 tons. The movement for September shows a slight decrease in comparison with the movement during August of the present year, when 5,548,311 tons were shipped. August will undoubtedly be the record month of the present year.

The fleet last year moved 4,877,441 tons in October and 2,641,886 tons in November, which marked the close of the iron ore season on the lakes. If the fleet moves an equivalent amount during the remainder of the present season, the total shipments for the year would be 32,356,464 tons. However, as shippers expect to be through with outside ships in October, the October and November movements will be light and it is not likely that the movement for the entire season of 1911 will be much in excess of 31,000,000 tons. The total movement for the season of 1910 was 42,620,201 tons.

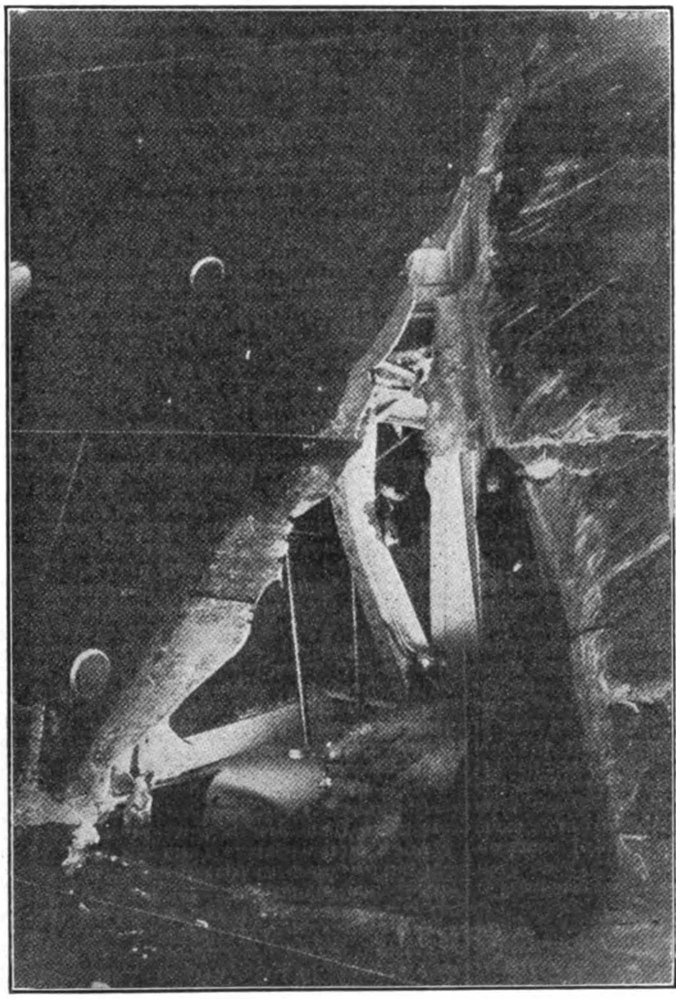
Following are the shipments by ports:

Port.	1910.	1911.
Escanaba	705,801	668,595
Marquette	439,442	367,964
Ashland	557,858	368,945
Superior	1,256,665	1,563,836
Duluth	2,041,908	1,131 247
Two Harbors	1,272,158	1,130,482
	6,273,832	5,231,069
1911 decrease		1,042,763

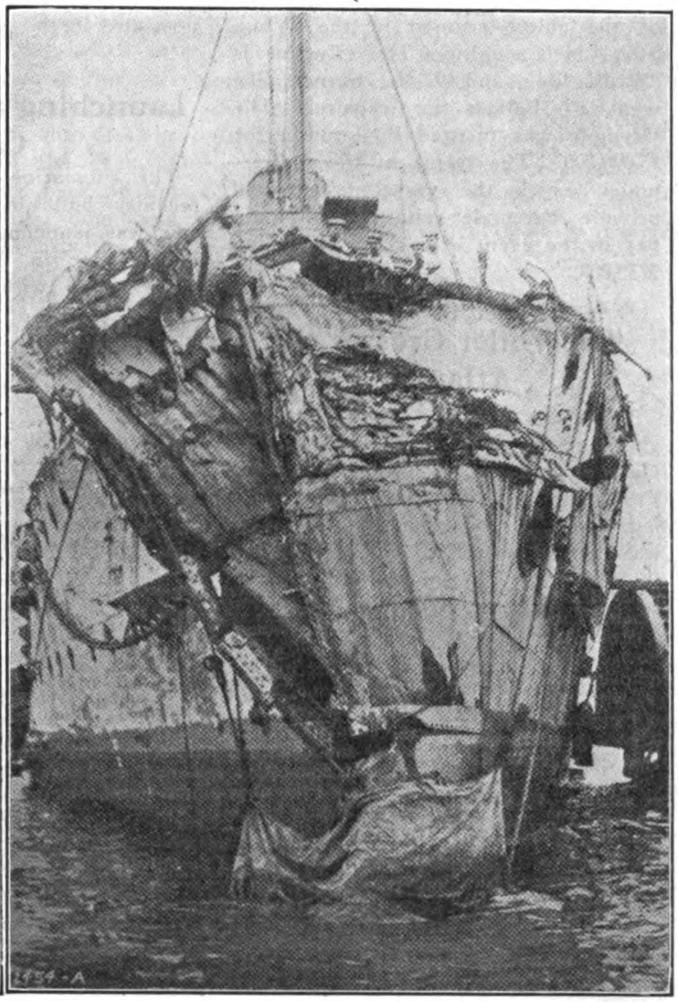
Port	To Oct. 1, 1910.	To Oct. 1, 1911.
Escanaba	3,868,072	3,086,847
Marquette	2,689,219	1,568,711
Ashland	3,436,829	1,878,786
Superior	6,484,352	7,946,109
Duluth	11,865,552	5,501,364
Two Harbors	6,756,840	4,855,320
	35,100,864	24,837,137
1911 decrease		10,263,727

OLYMPIC IN COLLISION

THE White Star liner Olympic, the largest vessel in the world, was in collision at noon, Sept. 20, with the first class cruiser Hawke in Cowes Roads, Isle of Wight. The Olympic was just beginning the voyage outbound for Southampton with nearly 3,000 persons aboard. A rigorous inquiry will be instituted into the cause of the collision, as upon the surface it appears to be totally inexcusable. The collision occurred in broad daylight. A slight rain mist prevailed, but in no sense sufficient to obscure vision. The Hawke was returning to Portsmouth from a trial trip, having entered the Solent by the Needle's passage going east and was going along at a good speed in the same direction as the Olympic. The cruiser rapidly overhauled the Olympic and when near the Prince Consort buoy apparently attempted to pass her on the starboard side and then altered her course and tried to get under the Olympic's stern. This maneuver appears to have been attempted when her bow had about reached the Olympic's main mast. The result of the sudden swinging to port was that the Hawke struck the Olympic a right angle blow between aft and the mizzen mast, tearing a hole about 40 ft. across and tapering down to below the water line. When the vessels drew apart it was seen that the Hawke's stem had buckled up like paper. She heeled over but gradually righted herself and was able to make her way to Portsmouth, dipping at the bows slightly. Upon the instant of the impact the Olympic's watertight compartments were closed and collision mats hung out. She came to anchor with a slight list, but was in no danger of sinking. Scores of tugs put out from Cowes Harbor and stood ready to render any assistance necessary. Perfect discipline was maintained aboard the Olympic, some of the passengers in the interior part of the ship forward not even knowing that an accident had occurred. Various theories are propounded to account for the collision, but pending the result of the court of inquiry, no official statement will be made. That most generally held is that something must have gone wrong with the cruiser's steering gear as she was overhauling and passing the Olympic, causing her to suddenly change her course. Another supposition is that the backwash of the liner created an eddy which placed the cruiser temporarily out of control. Had this maneuver been attempted in the restricted waterways of the great lakes, the accident would have been attributed to, and doubtless would have been caused by, suction. If the channel was narrow or the waters shallow at the precise spot where the Hawke endeavored to pass the Olympic, the Olympic's propellers would in all probability have caused



THE STARBOARD QUARTER OF THE OLYMPIC.



DAMAGED BOW OF THE HAWKE.

her to take an abrupt sheer. At any rate the weather was not a factor.

The Olympic has been in commission only three months and the accident has occurred at a time when it puts the company to the greatest inconvenience. Hundreds of persons delayed their passage home in order to take advantage of the Olympic's sailing and, as practically all westward bound ships are crowded during this time of the year, the White Star line had difficulty in accommodating passengers. However, everything was done that could be done to provide for their comfort and to expedite their transportation to the United States.

The Hawke is a first class twin screw protected cruiser of 7,350 tons, attached to the Portsmouth division of the home fleet. She is commanded by Commander William F. Blunt. She was built at Chatham in 1891 and her complement is 544 men. The length of the cruiser is 360 ft., beam 60 ft., and maximum draught about 26 ft.

The Olympic was delivered to the White Star Line by Harland & Wolff, of Belfast, Ireland, in the early summer and began her sailings on June 14 last. Her commander, Capt. E. J. Smith, formerly of the Adriatic, is one of the ablest seamen in the White Star Line's employ. The Olympic is 852 ft. long and 92 ft. beam. She went to Belfast for repairs. The Olympic was insured in London for $5,000,000. The terms of the policies under which the vessel is covered provide that underwriters should only pay in the event of a claim exceeding $750,000.

The Toiler Crosses the Atlantic

The Toiler, driven by two Diesel engines of 180 h. p. each, arrived at Halifax, Sept. 22, from Middlesbrough, England, with 2,000 tons of cargo, having made the voyage in 30 days. She was the first vessel so equipped to cross the Atlantic. The time of crossing is regarded as quite creditable, as the ordinary steamer with twice the power takes about 24 days. The Toiler was built at the Neptune works of Swan, Hunter & Wigham Richardson. This firm has built quite a number of vessels for service in Canadian waters. Not having had actual experience in building this type of engine, the firm arranged with the Aktiebolaget Diesels Motorer of Stockholm to provide the engines, which are of the two-cycle, reversible marine type, using crude oil.

After completing the vessel, trial trips were made in light and loaded conditions, and in order to have actual sea experience, the vessel was sent on two voyages loaded, one to Calais and the other at Bologne, returning to the Tyne light. These voyages sufficed to show the reliability of the engines and the builders had no hesitation in loading the Toiler and sending her across to Canada. There are at present perhaps as many as half a dozen vessels being built, which are to be fitted with Diesel engines of 1,000 h. p. or more, but Swan & Hunter preferred to experiment with the comparatively small power of the Toiler before taking up the building of larger Diesel engines, and as a result of the careful observations taken on the trial trips and voyages of the Toiler, they now have most valuable experience and data to work upon. They are at present building in their Neptune engine works a set of 400-h. p. Diesel engines and expect shortly to be dealing with oil engines of larger power. With the Diesel oil engines there are no boilers, no coal, no ashes, with consequent saving of weight of fuel used. It is stated that the Toiler consumes less than two tons of crude oil per day, while steam engines of equal power would require a consumption of about eight or nine tons of coal.

John Reid & Co., of Montreal, were associated in the design of this steamer.

Launching of Submarine Carp

The submarine torpedo boat Carp, recently built by the Electric Boat Co., was launched at the Union Iron Works late in August, and is now being fitted with electric appliances at the yards of the latter firm, in San Francisco. The Barracuda will be ready for launching in about three months, and the Pickerel and Skate are under construction at Seattle, while the keel of a fifth boat was recently laid on the ways vacated by the Carp.

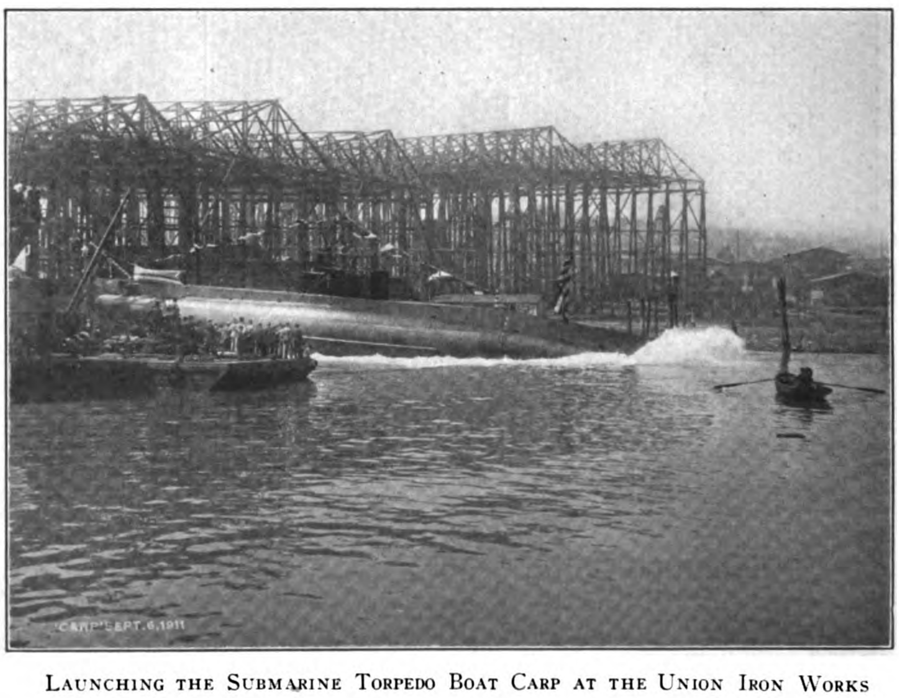
The Carp and vessels of her class will have a higher speed and wider radius of action than any other of the submarines which have been launched. This has been made possible by the use of kerosene as fuel in what are known as heavy oil engines. The engines in the Carp are a modification of the Diesel type. The internal combustion engine can only be used in communication with the outside atmosphere. The power used when the boat is submerged is obtained from storage batteries.

The Carp is 142 ft. 7 in. over all. The extreme breadth is 15 ft. 5 in., and the depth from deck to keel is 16 ft. 10 in. The displacement submerged is 400 tons.

The vessel is equipped with two heavy oil engines, four-cycle type, with six cylinders developing a horsepower of 780.

The electrical installation consists of a storage battery, main and auxiliary motors, switchboards, lighting plant, heating plant and electric ranges for galley. The main motors develop 350 h. p. at 285 revolutions per minute.

The Carp is provided with two air compressors and a storage system consisting of a large number of steel flasks arranged in batteries from which air can be drawn for expelling water from the various tanks in the



LAUNCHING THE SUBMARINE TORPEDO BOAT CARP AT THE UNION IRON WORKS

vessel as well as providing an ample supply of air throughout the ship.

Four torpedo tubes are installed in the bow, while two reserve torpedoes are carried on the battery deck. There are a double set of periscopes which enable the commanding officer to have a clear view ahead as well as that surrounding the vessel when everything is submerged except the end of the periscope. The vessel is also equipped with submarine signal apparatus for use when sunk to a depth which submerges the periscope.

The Carp is designed to carry a crew of 18 men and is fitted up with staterooms, living quarters and galley. Her minimum radius is 2,400 miles and the maximum radius is 3,200 miles. This means that the Carp can travel as far as Honolulu without escort of any kind.

The vessel was launched under the direction of W. R. Sands, of the Electric Boat Co., and Lieut. Kirby Chrittenden, inspector of machinery and assistant naval constructor, and A. H. Van Keuren, United States navy. Miss Josephine Tynan, daughter of Joseph Tynan, general manager of the Union Iron Works, christened the vessel.

A trained crew will soon arrive from the east to give the Carp its trials. The contract calls for a speed of 14 knots on the surface and 11 knots submerged.

Battleship Liberte Wrecked

The explosion on the battleship Liberte, at about 6 a. m. on Monday, Sept. 25, has resulted in a disaster to the French navy even more serious than that occasioned by the loss of the Jena in 1907. The loss of life is unfortunately much greater, and the loss of the battleship in this instance appears to be almost complete, as is shown by the view reproduced herewith. The number of the killed amounts to 226, and of injured to about 180. Reports differ as to the cause of this catastrophe. At first it was stated that the primary cause was a fire, which got to the magazines before they could be flooded. Subsequently, however, the opinion seems to have gained ground that the accident was due altogether to spontaneous combustion of the so-called "B" powder used in the French navy. A statement made by Admiral Bellue, of the squadron to which the Liberte belonger, supports this view. The admiral states that there were two reports, and 19 minutes later the vessel blew up. This lapse of time is stated to agree with what occurred in the case of the Jena, and to conform to what might be expected to happen under certain conditions with this powder. The vessel carried, in common with other ships of the squadron, a certain amount of defective shells which were to be used as soon as possible, and the admiral has issued instructions that all the rest of this ammunition in the fleet shall be landed at once. A feature of the disaster was the blowing up of the deck of the vessel, which doubled back on the vessel itself. The damage done was widespread, numbers of casualties occurring on neighboring vessels. The Republique, lying some distance away, was hit by a mass of armor-plate which has been estimated to weigh 37 tons, and had to be taken into dock for this to be removed.

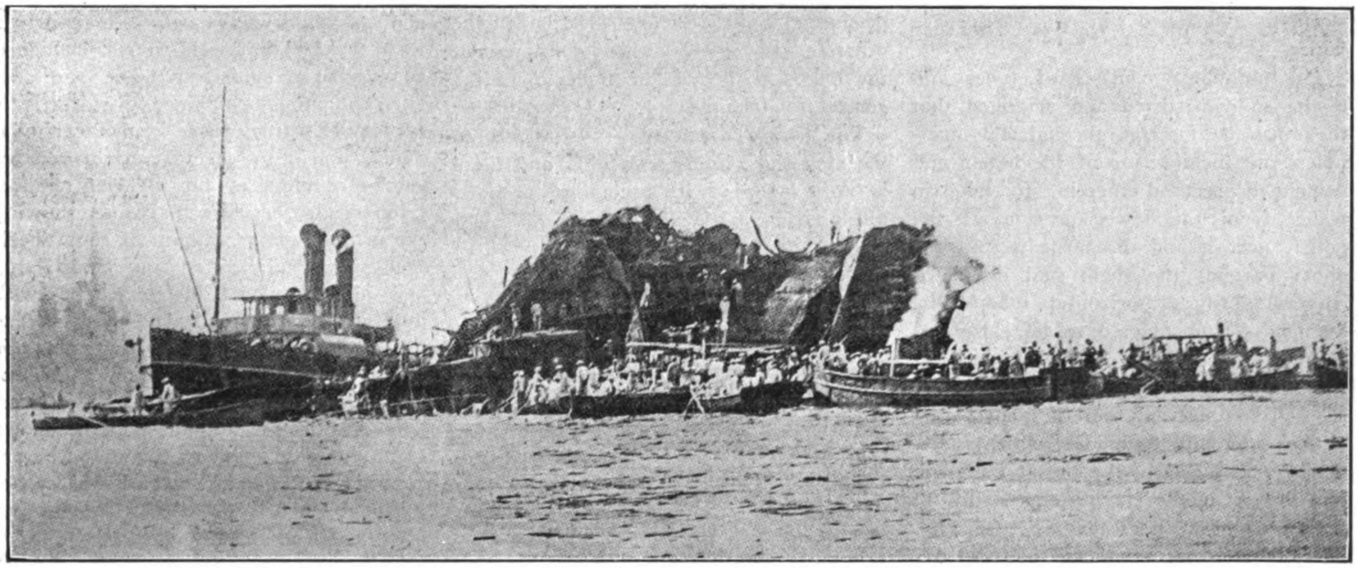
Diesel-Engined Tank Ship Vulcanus

THE MARINE REVIEW has been supplied with the following interesting statistics of a recent voyage completed by the sea-going Diesel-engined ship Vulcanus. This vessel, built last year by the Nederlandsche Fabriek van Werktuigen en Spoorweg-Materieel, of Amsterdam, and propelled by a six-cylinder 500 b. h. p. Werkspoor Diesel engine, made a voyage from Rotterdam and London to Constantza (Roumania) and home to Hamburg and Rotterdam. The engine is in very good condition. In Constantza the vessel was the object of much curiosity on the part of the authorities, and directly after her arrival she took some representative people for a day's trip on the Black Sea. The following figures speak for themselves:

Trip.	Time. Days.	Hours.	Min.	Sea miles.	Displacement, Tons.	Fuel consumption. Tons.
Rotterdam-London	..	19	45	141	2,200	1.8
London-Constanza	19	4	15	3,263	1,480	37.5
Constanza-Hamburg	20	22	35	3,595	2,180	42
Hamburg-Rotterdam	1	19	..	360	1,360	2

The remarkably low figure of fuel consumption, which we believe represents not one-fifth of the quantity of coal that would be used by a steamship of similar size, and the reliability of the Diesel engine in service, are the two outstanding features of the vessel.

The Twelfth International Congress of Navigation will be held in Philadelphia in the spring of 1912.



SHOWING HOW THE BATTLESHIP LIBERTE LOOKED AFTER THE EXPLOSION.

New Automatic Circulator for Scotch Boilers

The Eckliff Automatic Boiler Circulator Co. has recently placed on the market a new automatic circulator for Scotch boilers, and has recently brought it to the attention of vessel owners on the great lakes. One of these circulators has been installed on the steamer Pentland and the engineer of that steamer reports that it is giving satisfaction. The circulator can be installed within a couple of hours in the boiler and it is claimed for it that it will equalize the temperature in the bottom and top of the boiler and thereby tend to eliminate the trouble caused by leaky circumferential seams and the pitting and cracking of furnace bottoms. A diagram is herewith published showing the circulator installed in a two-furnace boiler.

The circulator consists of tubes and piping so constructed and arranged that they may be inserted through the manholes into the interior of the boiler and detachably secured therein, to take in water from the lower portion of the boiler, heat it and discharge it into the upper part of the shell, said circulator consisting of a horizontal tube 2 in. diameter, same adapted to lie close and extend longitudinally of the bottom of the boiler, as shown by B, a tee (C) secured to one end thereof, and a vertically extending tube (E), which is detachably attached to the tee at its lower end by a nipple (G) adapted to fit within the lower end of the tube (E). (E) is a 3 in. seamless tube No. 16 gage extending upward alongside the fire chamber or furnace near one end, and is bent to the arc of the furnace, then formed with a short bend at No. 5 and extending longitudinally along and adjacent to the upper side of the furnace in a straight run to near the opposite end of the furnace, where it is again bent slightly upward to aid the discharge. The tube running along the top of the furnace is 3 in. diameter, 16 gage wall, and is preferably flattened at points of contact on the furnace to give greater heating area.

On the tubes at the bottom of the shell, elbows (A) and (D) are provided to open upward, same to permit the water to freely enter the pipe and pass up into the vertical and horizontal tubes (E) and (F).

There are two complete sets of tubes installed for each furnace requiring a circulator to permit one circulator to discharge at the front head and the other circulator will then discharge at the opposite end of the boiler near the combustion chamber.

The entire apparatus is shackled to the stay rods, brace and tubes and there is no danger of its becoming loose or displaced in any way.

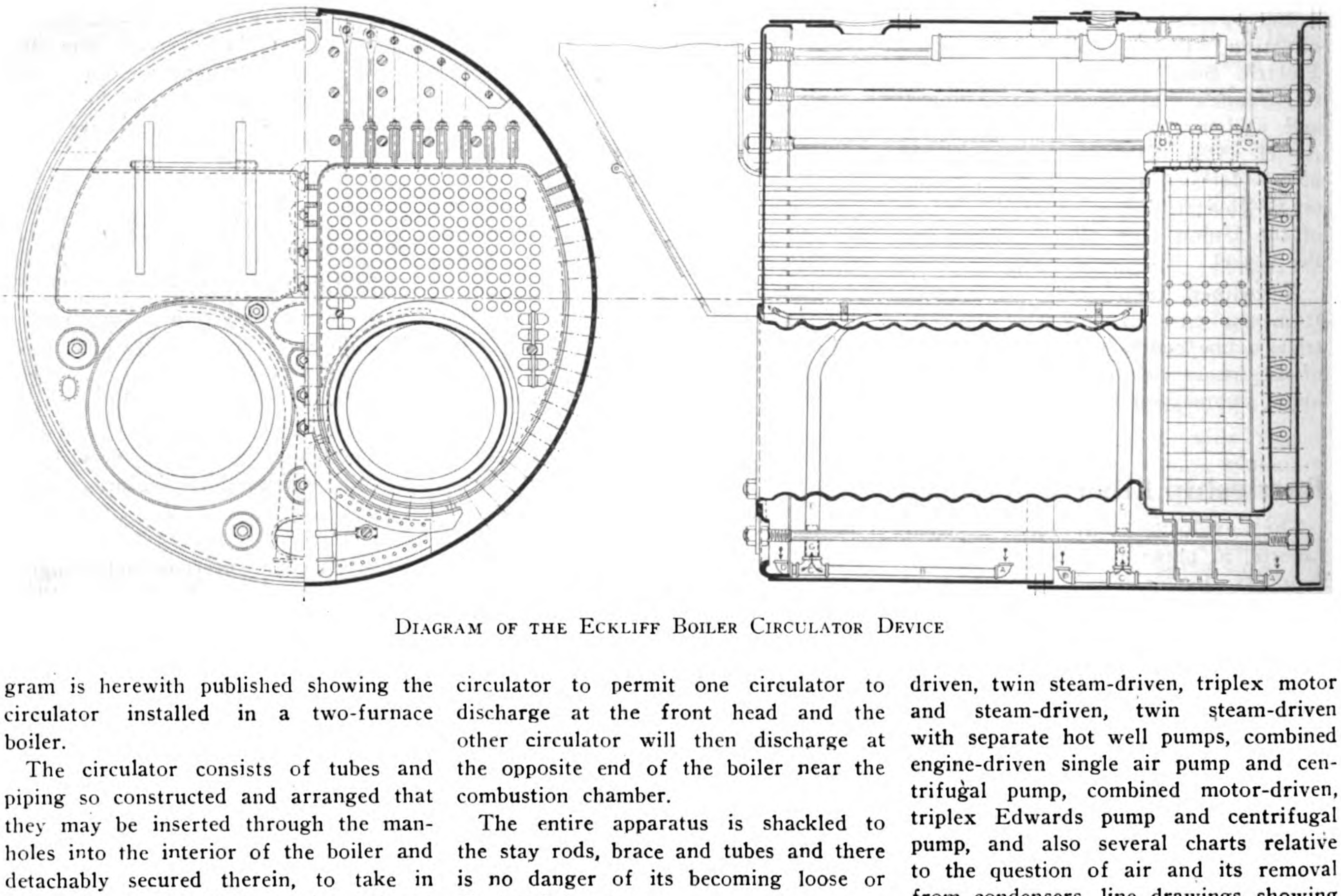


DIAGRAM OF THE ECKLIFF BOILER CIRCULATOR DEVICE

Air Pumps

Bulletin 103, just issued by the Wheeler Condenser & Engineering Co., is a new edition of their bulletin on the Wheeler-Edwards air pump for operation in connection with surface condensers, handling both the air and condensed steam.

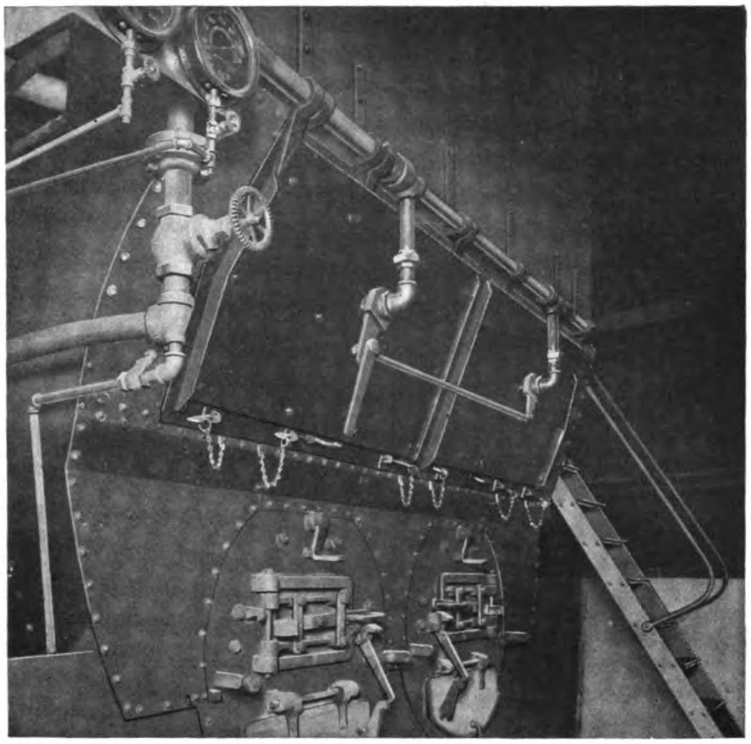
The function of the air pump and its relation to the condenser proper are first taken up and then the construction and operation of the Wheeler-Edwards air pump and a comparison of the efficiency of the Wheeler-Edwards air pump with other types of pumps handling air and condensate, discussed in detail. The pages following are devoted to the various uses for the Wheeler-Edwards air pump, such as high vacuum Wheeler dry tube condensers for steam turbines, special application in marine work, giving a drawing showing how the Wheeler-Edwards air pump is built into the main engine frame, the use of the Wheeler-Edwards air pump in connection with small jet condenser and in connection with sugar effects for handling both the sweet water and the air and water from the condenser.

This bulletin contains upwards of 50 illustrations, including photographs of the numerous types of Wheeler-Edwards air pumps, for instance, single steam-driven, twin steam-driven, triplex motor and steam-driven, twin steam-driven with separate hot well pumps, combined engine-driven single air pump and centrifugal pump, combined motor-driven, triplex Edwards pump and centrifugal pump, and also several charts relative to the question of air and its removal from condensers, line drawings showing the manner of installation of the Wheeler-Edwards air pump on board ship and also for use in connection with multiple effects, and lastly, numerous illustrations of Wheeler-Edwards air pumps installed in connection with condensers for various classes of services. The frontispiece of the bulletin shows eight notable power plants wherein condenser equipments of a rated capacity of over 4,250,000 lbs. of steam per hour are installed.

The last pages of the bulletin contain an outline drawing of a Wheeler-Edwards air pump, together with a list

of details which may be used in ordering repair parts. This list is also furnished in blue print form for posting in the engine room. Pages 30 and 31 give an illustrated condensed catalog of the Wheeler line of condensing apparatus covering the following headings: Wheeler surface condensers, Wheeler Volz combined condenser and feed water heater, Wheeler dry tube condensers, Wheeler rectangular jet condensers, Wheeler barometric and jet condensers, Wheeler-Edwards air pumps, Wheeler rotative dry vacuum pumps, Wheeler centrifugal pumps, Wheeler-Barnard cooling towers, Wheeler feed water heaters, Wheeler atmospheric exhaust valves.

Copies of this bulletin, No. 103, will be sent by the Wheeler Condenser & Engineering Co., of Carteret, N. J., to engineers, upon request.

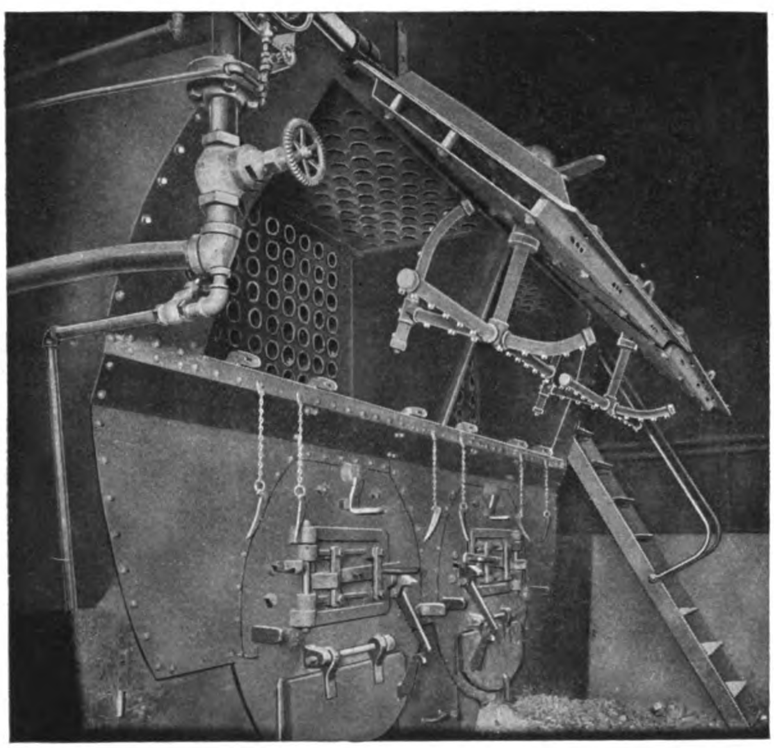


FRONT END BLOWER WITH DOOR CLOSED

Front End Blower

The Diamond Power Specialty Co., Detroit, Mich., has recently decided to put on the market a front end blower for marine service. The new model is illustrated with the accompanying engravings and is a very simple and effective device. Provision is made for cleaning both the fire tubes and air tubes with equal thoroughness. This is accomplished by means of the oscillating arm, in which are fitted jets in sufficient quantity to thoroughly cover each tube end. These arms are controlled and rotated in a quarter circle by means of a handle on the outside, and as a result the corner tubes, which are most frequently neglected, are especially favored. Where special hinges can be applied with no inconvenience, a steam line to blower is made to act as a hinge pin upon which the smokebox door hangs, as shown in the illustration.

Where the blower is to be attached to a boiler already in service the steam line crosses below the door, the connection being made through a union which may be readily disconnected when the door is to be opened. Another advantage lies in the fact that the blower is wholly withdrawn when the doors are opened, leaving all tube ends exposed for inspection and repairs.



FRONT END BLOWER WITH DOOR OPEN

Schuette Recording Compass

The Schuette recording compass was installed a few months ago on the steamers Peter White and Pontiac of the Cleveland-Cliffs Iron Co.'s fleet. Both masters speak in the highest terms of it as it gives them an infallible index of everything that occurs in the pilot house every minute of the day. Capt. Johnston, shore captain, believes that it has resulted in better steering, which would be quite natural, as it puts the wheelsmen on their mettle.

The Schuette recording compass has been on the market only a few months and so far only eighteen instruments have been completed. However, these have found their way to all quarters of the globe, one having been recently installed on a Japenese merchant ship. The Woerman Line of Germany has also ordered two of them.

Steamer Eocene Launched

The steamer Eocene, building for the Standard Oil Co. at the Cleveland yard of the American Ship Building Co., was launched Sept. 16, being christened by Mrs. R. C. Viet, of New York, wife of the general manager of the marine department of the Standard Oil Co. R. C. Viet and Daniel E. Ford, of New York, were present. The Eocene is a duplicate of the steamer Perfection, which was delivered to the Standard Oil Co. a few months ago from the same yard. The new steamer is 260 ft. over all, 250 ft. keel, 43 ft. beam and 23 ft. deep. She is equipped with a triple-expansion engine with cylinders 24, 39 and 63 in. diameter by 42 in. stroke, supplied with steam from two Scotch boilers, 14½ ft. in diameter and 11½ ft. long. The Eocene will have capacity for 800,000 gallons of oil.

Porhydrometer on Neptune

A porhydrometer is to be installed on the Neptune, the newest collier built for the navy, for experimental purposes. The secretary of the navy has just authorized an expenditure of about $3,500 for that purpose. A porhydrometer is an apparatus designed to weight with the utmost accuracy the dead weight placed on board or removed from any ship, barge or other floating vessel to which it is fitted. In case the apparatus does all that is claimed for it, it will be of great value in the handling of coal for naval vessels and in the settlements of disputes about the quantity of coal shipped on naval colliers and delivered to other naval vessels or at foreign stations.

Book Review

The Copper Handbook, vol. X; 1,902 pages; 5½ x 9 in. Price, $5. Horace J. Stevens, Houghton, Mich., publisher.

The tenth edition of the Copper Handbook is out. It has grown to encyclopedic proportions, containing nearly 2,000 pages and describing over 8,000 copper mines and copper mining companies in all parts of the world. There are 24 chapters, touching upon every phase, including the history of copper, its chemistry, mineralogy, metallurgy, brands, grades, alloys and substitutes, in addition to which tables are given covering production, consumption, movement, price and dividends. The book will be mailed for inspection by the publisher to anyone interested.

Trade Notes

The International Oxygen Co. has removed its New York headquarters from 68 Nassau street to 115 Broadway, where increased facilities have been secured for transacting its business. The new location is especially well fitted for the company's needs and easy of access for parties coming into New York City, who may want to investigate the methods of the I. O. C. system of oxygen and hydrogen manufacture for commercial purposes. The success of the I. O. C. system, since its introduction into this country a few months ago, would indicate a continued increase in the company's business with still greater accommodations in the near future.

C. R. Vincent, for many years president of the Ball & Wood Co., has assumed the managership of the Monel metal department of the Ruggles-Coles Engineering Co., 50 Church street, New York City, general agents for the Bayonne Casting Co. At its foundry in Bayonne, N. J., the latter company has for some years been making with success castings of this remarkable alloy that is stronger than steel and less corrodible than bronze. Some of these castings range over 85,000 lbs. in weight. Sheets, rods, wire and screens of the same metal will also be handled by the company with which Mr. Vincent is associated.

Owing to the death of Henry G. Trout, it has become necessary to reorganize the H. G. Trout Co., of Buffalo, of which he was so many years the head. Wm. B. Trout has been elected president, Lilian G. Trout, vice president; Herbert H. Walker, secretary and treasurer. These officers, with Wm. Mummery and Edward H. Reading, constitute the board of directors. The new company will, of course, live up to the traditions of the old.

SUMMARY OF NAVAL CONSTRUCTION.

Name of Vessel.	Building at.	Per cent of completion. 1911. Aug. 1.	Sept. 1.
	BATTLESHIPS.		
Florida	Navy Yard, New York	98.1	98.6
Utah	New York S. B. Co	99.6	100.0*
Wyoming	Wm. Cramp & Sons	70.8	77.5
Arkansas	New York S. B. Co	71.3	72.8
New York	Navy Yard, New York	2.5	4.5
Texas	Newport News S. B. Co	24.8	30.0
	TORPEDO BOAT DESTROYERS.		
Patterson	Wm. Cramp & Sons	91.1	98.5
Fanning	Newport News S. B. Co	33.3	42.7
Jarvis	New York S. B. Co	23.9	29.0
Henley	Fore River S. B. Co	13.8	15.5
Beale	Wm. Cramp & Sons	38.2	46.6
Jouett	Bath Iron Works	50.5	59.2
Jenkins	Bath Iron Works	40.3	48.3
	Bath Iron Works	No report.	
	Bath Iron Works	No report.	
	New York S. B. Co	No report.	
	Fore River S. B. Co	No report.	
	Wm. Cramp & Sons	No report.	
	Wm. Cramp & Sons	No report.	
	Wm. Cramp & Sons	No report.	
	Wm. Cramp & Sons	No report.	
	SUBMARINE TORPEDO BOATS.		
Carp	Union Iron Works	90.3	91.0
Barracuda	Union Iron Works	90.0	90.0
Pickerel	The Moran Co	84.9	85.3
Skate	The Moran Co	85.1	85.4
Skipjack	Fore River S. B. Co	93.2	93.3
Sturgeon	Fore River S. B. Co	93.2	93.5
Thrasher	Wm. Cramp & Sons	48.5	53.2
Tuna	Newport News S. B. Co	77.2	79.2
Seal	Lake T. B. Co	88.2	88.2
Sea Wolf	Union Iron Works	36.0	40.8
Nautilus	Union Iron Works	36.4	40.8
Garfish	The Moran Co	35.9	40.7
Turbot	Lake T. B. Co	23.1	26.6
Haddock	Fore River S. B. Co	0.0	6.0
Cachalot	Fore River S. B. Co	0.0	6.0
Orca	Union Iron Works	0.0	1.5
Walrus	The Moran Co	No report.	
	SEA-GOING TUGS.		
	New York S. B. Co	No report.	
	New York S. B. Co	No report.	
	COLLIERS.		
	Newport News S. B. Co	Inappreciable.	
	Newport News S. B. Co	Inappreciable.	
	Maryland Steel Co	No report.	
	Maryland Steel Co	No report.	
Jupiter	Navy Yard, Mare Island	No report.	

*Utah was delivered at navy yard, Philadelphia, Aug. 30, 1911.

ACCIDENTS TO LAKE VESSELS

One of the most serious accidents of the month was the collision between the steamer Joliet and the Henry Phipps, in the St. Clair river, opposite Port Huron, on Sept. 22. The Joliet, which had just come to anchor, was struck on the starboard side by the Phipps during a heavy fog and sank almost immediately. This is the second accident of the kind that has happened within a month in this vicinity, and in all probability as a result some certain plan will be followed for anchoring in the fog at this point. Before coming to anchor vessels should get as far out of the channel as they can. It has not as yet been determined whether to blow up the Joliet or whether to salve her. It is likely, however, that she will be a total loss.

The steamer J. H. Wade, of the Richardson fleet, was sunk in collision with the Anchor Line steamer Codorus in the St. Clair river at the upper end of Southeast Bend. The Wade was downbound with a cargo of ore and the Codorus was upbound with package freight. Particulars as to the cause of this accident are not as yet obtainable but the Codorus struck the Wade on the port side opposite the boilers, causing her to fill immediately. Capt .Willet succeeded in beaching the Wade in shallow water near Joe Bedore's, on the American side, before she went to the bottom. The wrecker Favorite has been ordered to the Wade.

The little passenger steamer Favorite sank while lying at the dock of the Grand Island Ferry Co., Niagara river. The cause of the sinking is unknown.

The steamer C. H. Little collided with the steamer James H. Hoyt near Belle Isle, in the Detroit river, and sank. The Little was raised and docked at Detroit.

The steamer A. L. Hopkins became waterlogged on Lake Superior while downbound with a cargo of hemlock. She was abandoned by the crew and became a derelict, her boiler house being practically submerged and her bow in the air. A government vessel was sent to tow her out of the path of steamers.

The government dredge Maumee foundered on the east breakwater at Cleveland, on Oct. 4, and is probably a total loss.

Derangement of steering gear, as usual, caused quite a number of accidents.

Date.	Name of Vessel.	Nature of Accident.	Place.
Sept. 7	Str. E. J. Earling	Hit obstruction; broke her wheel	Chicago river.
Sept. 8	Str. M. A. Bradley	Struck by carferry M. & B. No. 2; several plates damaged	Conneaut.
Sept. 10	Str. Burlington	Grounded near breakwater in fog; released by tugs, uninjured	Buffalo.
———	Str. Rosemount	Struck on her way down; repaired at Montreal	St. Lawrence river.
Sept. 12	Str. C. H. Little	Collided with steamer James H. Hoyt and sank; floated on Sept. 13 and docked at Detroit Ship Building Co.'s yard	Belle Isle, Detroit river.
Sept. 12	Str. James H. Hoyt	Collided with steamer C. H. Little; few plates dented amidships on port side	Belle Isle, Detroit river.
Sept. 14	Tug Alva B	Broke an eccentric and was towed back to Cleveland	Lake Erie, near Cleveland.
———	Schr. Resumption	Ran ashore; released on Sept. 15; rudder broken and bottom damaged; docked at Sturgeon Bay	Pilot Island.
Sept. 15	Bge. Winnipeg	Struck and later sank near Farran's Point; towed by tug Thomson when accident occurred; contract let for recovering her to Hackett T. & W. Co.; coal cargo valued at $4,000	Williamsburg canals.
Sept. 15	Tug Circle	Struck by steamer Martin Mullen and crushed against pier at Houghton and sank; raised Sept. 21 and taken to Houghton; leaked slightly	Upper Portage Lake canal.
Sept. 15	Str. City of Kalamazoo	Wheel chains parted, causing her to hit north pier	Saugatuck, Mich.
———	Str. Corunna	Hit by steamer Lake Manitoba; damaged to extent of about $5,000; docked at Montreal	Montreal, Que.
Sept. 18	Str. Sinbad	Ran ashore loaded with grain; released Sept. 21	Cape Vincent.
Sept. 19	Tug Martin	Completely destroyed by fire while lying at B. & O. docks; hull was sunk when fire reached water line; loss, $2,000; machinery will be saved; cause unknown	Sandusky.
———	Str. H. M. Pellatt	Ran ashore, loaded with grain; out 4 ft; released Oct. 4 after lightering most of cargo; leaked and will be docked	Pt. Iroquois, St. Lawrence river.
———	Str. W. A. Rogers	Struck; damaged No. 5 tank on starboard side; repaired at Lorain.	Two Harbors, Minn.
———	Str. Iron King	Struck Dearborn street bridge, slightly damaging it; steamer not injured	Chicago, Ill.
———	Str. Resedale	Ran ashore; released after lightering	Lachine Lake.
———	S. O. Bge. No. 6	Struck; docked at Cleveland Sept. 21	Welland canal.
Sept. 22	Str. Joliet	Collided with steamer Henry Phipps and sank almost instantly; hit on starboard side; crew escaped	St. Clair river, near Port Huron.
Sept. 22	Str. Henry Phipps	Collided with steamer Joliet; number of plates damaged and stem badly twisted; repaired at Lorain	St. Clair river, near Port Huron.
Sept. 22	Str. Alpena	Hit by steamer Phipps; several plates damaged and stem twisted	St. Clair river, near Port Huron.
Sept. 22	Str. Ontario	Hit wrecked steamer Joliet and damaged two plates	St. Clair river, near Port Huron.
Sept. 22	Bge. Grace Holland	Ran aground; released after lightering part of her cargo of lumber	Niagara river, off Riverside Park.
———	Str. E. H. Gary	Steering gear became disabled and she struck; leaked forward; released	Walpole Island, St. Clair river.
Sept. 25	Str. Thomas Cranage	Ran on a reef; out 6 ft. forward; wreckers working on her	Outside of Tiffin Harbor, Ont.
Sept. 25	Str. City of Ottawa	Became disabled; took about 10 hours to make repairs to her machinery	Off Fairport, Lake Erie.
Sept. 28	Bge. Exile	Waterlogged in run across Lake Superior in heavy sea; towed inside breakwater of Portage ship canal, where she sank; will be raised	Lake Superior.
———	Str. Peters	Ran aground	Entrance to Portage Lake.
———	Str. D. Leuty	Broke her air pump	Lake Huron.
———	Str. Three Brothers	Ran ashore; entire deck load of lumber carried away; total loss	South Manitou Island.
Oct. 3	Str. A. L. Hopkins	Became waterlogged and drifted about in lake, bow high out of water and boiler house completely under water	Lake Superior.
Oct. 3	Str. Favorite	Sank in 13 ft. of water while lying alongside dock of Grand Island Ferry Co. on Grand Island; cause of sinking unknown	Niagara river.
Oct. 4	Dredge Maumee	Foundered on east breakwater in storm; crew had very thrilling escape	Cleveland, O.
Oct. 4	Str. J. H. Wade	Collided with steamer Codorus and sank in shallow water on American side	St. Clair river.
Oct. 4	Str. Codorus	Collided with steamer J. H. Wade; deranged steering gear thought to have caused accident; only slightly damaged	St. Clair river.